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ABSTRACT

This teacher's guide has been constructed to assist in developing and implementing a life science course with an environment/ecological unit for Grade 7. Designed primarily for use with other science units, it offers numerous multidisciplinary activities which emphasize involvement in problem-solving through open-ended investigation rather than problem-doing only. Activity ideas range from making a tin can barometer, conducting a plot study, and collecting insects and flowers from grassy fields to the study of food chains, natural areas, and golden rod galls; from tree measurement, soil study, and ecology and natural resources projects to an examination of eutrophication, community relationships, and pollution. Resource material compiled in the final section gives an annotated film list, a bibliography of books, and sources for free and inexpensive materials oriented to the seventh grade level. Related documents are SE 016 626 and SE 016 628. (BL)

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TEACHER'S GUIDE

ECOLOGY

GRADE 7

SE 016 627

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"I may be just a
red squirrel to you,
but remember, I have to
drink the same water
and breathe
the same air
that you do"

A Hint----An I dea

Athough this is a study in science, ecology will extend beyond that which is usually thought of as the science period.

Involvement should be stressed for motivation of the student. The importance of the "Why is it here?" not necessarily the "What is it?" should reoccur through our teaching.

The following guidelines may be considered as this ecology unit is taught:

1. At least two hours per week for ecology.
2. Teach where the action is--outside the classroom as often as possible.
3. Expose children to school grounds to appreciate and take pride in their school community.
4. Enlist the aid of the PTA to secure resource people who have an interest in this area (not necessarily experts).
5. The importance and need for many field trips to observe, contrast, and compare similar and different natural communities.
6. Teach students to return living things to their natural habitat once they have been observed.
7. It is hoped that this ecology program will be used as the basic unit with the other science units (matter and energy, machines) placed where the classroom teacher feels they are best related. After this material has been used in this way, a decision can be made as to how much of the year's work should be devoted to ecology.

ENVIRONMENTAL/ECOLOGICAL EDUCATION PROJECT

I - Purpose:

To develop and implement the Life Science Courses of the fourth, seventh, and tenth grades with an Environmental/ Ecological unit that will stimulate an on-coming generation which is aware of environmental relationships and processes, can understand how to solve environmental problems that arise, and is motivated to work toward their solution.

II - Needs For Which Project Was Written:

A. The Yadkin Valley area is basically rural, therefore, close and prompt attention is needed to prevent further ecological decay by ignorant practices and insufficient preventive protection and awareness.

B. Enroaching urbanity and industrialization is laying waste upon the remnants of our natural environments.

C. Inadequate coordination and communication greatly hinders present detached efforts being exerted toward environmental education, protection, and remediation.

D. Believing that it will be the on-coming generation that will act more positively and promptly; greater and more concise curricula must be developed and implemented in area schools that will provide avenues for immediate remediation, studies, and action.

E. Availability of existing institutions of higher learning, State Parks, campgrounds, and lake construction activities lend to the possibility of bringing these factors in harmony and cooperative efforts of positive action.

F. Efforts to undertake local studies of environment/ecological problems that could be transferred to a possible Ecological Center for further review and remediation. (Camp Vade Mecum.)

III - Objectives:

1. To focus efforts in Stokes County, which is the most rural county, yet where there is a State Park, several summer camps, potential site of an Ecological Center and a power company building a lake. Limited activities will be undertaken in the other three counties, but it is desired that replication would be in the next year if funds are available or can be fostered.

2. To allow students to do in-depth st es of environmental problems and be to present findings at science fa conferences, etc.

3. To allow students to have on-site field trips to gather first hand observation and data.

4. To fully acquaint all citizens of the county, through students and clubs, of the availability and proper utilization of the recently adopted Sanitary Landfill Systems.

5. To utilize the services of various community and civic groups to establish Action Committees and become involved in project activities.

The following general objectives for Environmental Education in North Carolina have been set forth:

1. To obtain a clear understanding that man is in a symbiotic relationship with his environment.

2. To obtain a broad understanding of the interrelations among ecosystems and natural resources.

3. To develop an understanding of man's environmental problems and the decision-making skills to cope with them.

4. To develop attitudes which will foster involvement by youth in combating environmental problems. *

*p.4. Teachers Guide for Environmental Education.

ENVIRONMENTAL EDUCATION: THE "HOW"

In planning and organizing classroom and school activities in environmental education it is imperative that educators be aware of the many new developments and changes in science teaching. These include current trends, guidelines for quality teaching, and ways of organizing classroom learning experiences.

TRENDS

There have been, in recent years, several prominent changes in science teaching which today could be thought of as emerging trends.

Emphasis on the "Why" of Science

In years past, the emphasis in science teaching was placed upon the "what" or factual knowledge of science. Educators have, however, in recent years, redirected the idea of facts as the foci of education. There were many reasons for this new orientation. Primary among them, however, were:

1. The rapid explosion of scientific knowledge or information. Every five years, in many science areas, new findings outdate previous "truths".

2. The expanding computer industry. It has been predicted that by the year 2000, man will be beginning to live in symbiotic relationships with computers.

Such events as the aforementioned, make it evident that knowledge of facts, while beneficial, is not necessary, particularly since today's "true facts" may be "tomorrow's falsehoods" and since past and current knowledge may be stored in an electronic brain. They also reveal that a movement away from an emphasis upon "facts" was, and is, inevitable.

Instead, the trend is to utilize man's capabilities as "thinkers", to encourage him to seek the answers to the "why" behind the "what". In other words, science should be taught as an intellectual pursuit. In this manner, it allows education, as Bruner states, "to not only take us somewhere, but allow us to go further, more easily."[1]

In seeking the solution to the "why" of a scientific phenomenon, the learner, indirectly, learns the "what" of science. He also learns more, for this approach enables the student to learn how to think as a scientist, the ways and approaches of a scientist, and the attitudes of a scientist.

Such an approach to science instruction facilitates transfer or carryover of this process to other subject areas. Thus, this trend could affect the total school curriculum of each pupil.

The most important aspect of this trend, however, is that through seeking the "why" of phenomena, learning becomes a process of self-directed self-discovery. In other words, it becomes personalized. It can facilitate a student's becoming totally involved in finding answers to problems, rather than having answers described to him for memorization.

The "what" of learning does not facilitate continual learning. However, through educating the learner to seek the "why" of his environment, continuous learning can be enhanced and perpetuated.

Greater Student Involvement in the Teaching-Learning Act

When a student is involved in determing "why", then he, in all likelihood, is an active, rather than passive learner; one, that is, who is involved in seeking solutions to problems rather than in causing them. If a student is totally involved in the teaching-learning act, then he will "discover" solutions to problems. He will be engaged in the process of scientific inquiry. He will become curious. He will learn how to devise, improvise, and utilize in the same manner as a scientist.

As students become involved in the teaching-learning processes, and subsequently, come to understand and know science to a greater degree, they also begin to "feel" and experience success. This, in turn, fosters a desire for further learning and involvement.

Emphasis Upon "Problem-Solving" Rather Than "Problem-Doing"

For years the term "problem-solving" has reverberated in educational circles. Its virtues have long been extolled by science educators. In many instances, however, what actually has taken place is not "problem-solving", but "problem-doing"; that is, "cookbook" science; science experiments which follow specific, detailed, step-by-step instructions; and which, if done correctly, lead the experimenter to prepackaged solutions already determined for him.

The current trend has problem-solving being actually that. Such an approach to learning results in an open-ended type of investigation; that is, one in which the solution of one problem leads to the creation of one or more additional ones. The problem is "attacked" or approached in a variety of ways. Numerous resources and many texts are utilized. In other words, a variety of processes, skills, competencies and materials are utilized.

Utilization of a Multiplicity of Learning Materials

The utilization of a variety of teaching aids and materials facilitates the processes of true problem-solving for it allows the learner to go to a variety of sources in search of solutions to problems. By appealing to a variety of senses, involvement of students can occur more readily. More important, however, it makes the teacher's task of providing for individual differences among students less

difficult. One type material, or aid, might appeal to one pupil, but not to another. By incorporating a variety of materials and resources, each student's needs can be more readily met. Needless to say, this trend is a healthy one.

Emphasis Upon Individualized Instruction

The phrase "individualizing instruction", like problem-solving, has been, for years, in the educator's vocabulary. By many it has been considered "educational jargon", the ultimate, the educator's utopia, and practically nothing else. This may be true. However, with today's innovation reformation in education, many instructional, electronic and architectural changes are helping to transform this "dream" into reality.

The instructional changes which are fostering this event include independent study programs, non-graded or continuous progress programs, programmed learning and modular scheduling.

Individualizing of instruction will not reach fruition over-night even with instructional, electronic and architectural changes. However, a good beginning has been made. Science teachers should ask themselves how they fit into this trend and what they are doing in light of the above changes. This is necessary because they represent the link which allows for individualization to actually work in practice. As this is done, the trend toward individualizing instruction will become an ever increasing force in the nation's schools.

Emphasis Upon Open-Ended Evaluations

Concurrent with the trend to individualize instruction is a movement toward open-ended evaluations. Typically teachers have used quizzes or tests as a means of evaluating pupil progress. Due to factors such as lack of time, large pupil-teacher ratios, teacher background and experience, these forms of evaluation, in many cases, have been factually oriented. For example, one question on a recent science test given in a junior high school read, "Electricity comes from _____ and _____." All pupils were given the same test and were expected to come up with identical answers. There is, however, a movement away from this type of evaluation to one in which all pupils are not expected to have the same answer, which is not factually oriented, which is dependent upon each child's abilities, and is of a problem-solving nature.

This trend away from factually oriented evaluations was influenced by the work of perceptual psychologists Maslow, Combs, and Rogers and their research findings and writings regarding self-concept. Essentially, they brought to the forefront the effect failure or success has upon the self-concept of pupils. For example, if a child has been given factual type quizzes and he does not make satisfying or adequate scores, after repeated failure, he comes to feel or believe that he cannot pass a test or learn. Thus he develops a negative attitude toward learning and school.

On the other hand, if he has been successful on factual type tests he goes into a test with self-confidence, assurance, and in all probability, will succeed on it. The problem is, however, that not all pupils can or will memorize facts.

The thinking of the perceptual psychologists is that all students in a class do not perceive a question in the same manner. Each student comes from a different background, has had different experiences; thus, all students will not perceive the same test question in a similar manner. In addition to this point, if one of the important elements in education is for students to be able to apply knowledge, a factual type evaluation would not be conducive. An open-ended type of evaluation makes allowance for individual differences, backgrounds, perceptions, and, at the same time includes questions which foster problem-solving or application type evaluations. For example, suppose a science class has been studying the cell. Rather than giving a quiz with questions such as, "What is the mitochondria?"; "Draw and label a typical cell;" or "Define deoxyribonucleic acid;" a teacher might utilize a quiz of a different nature. An appropriate quiz question could be, "Compare the organization or structure of the cell to the structure or organization of society in the United States." This type question requires that each pupil possess knowledge of the cell and its working. However, at the same time, it is of a problem-

solving nature, requires application, transfer of knowledge, is open-ended and flexible enough to allow for individual differences and abilities among students in the science class. Rather than being forced to memorize and regurgitate facts about the cell, students would be encouraged to compare, draw relationships and make inferences. In other words, they would be learning to think critically while engaging in an evaluation exercise.

If the emphasis in teaching is on seeking the "why" of science, involvement of students in the learning act, upon problem-solving and individualizing of instruction, then evaluations must be of the same nature. An examination or quiz of only a factual nature would reflect a great inconsistency.

Emphasis Upon Self-Concept Development

In recent years, educators have come to the realization that not only are they teaching science; they are teaching students -- human beings with feelings. These feelings vary with the individual. However, all possess feelings about themselves as persons and as learners.

Through research it has been shown that usually students who do not possess adequate perceptions of self feel that they are less capable or adequate than their peers.[2,3,4] This, of course, leads to an accompanying lack of achievement and self-respect.

In a classroom atmosphere in which the student has learned to accept himself, he will want to learn science. On the other hand, if he cannot accept himself as a person and learner, he will not learn. If a classroom lends itself to student involvement, pupil-performed laboratory work which is characterized by a variety of experiments utilizing varying abilities and interests, and individual pupil assignments in lifelike situations students will, in all probability, experience success in learning. This, in turn, will foster or manifest feelings of adequacy on the part of the learner.

Emphasis Upon Development of Values

Louis E. Raths, and associates, in their book, VALUES AND TEACHING, state that there are too many children in schools who do not learn as well as they might because they are unclear about what they value.[5] Possibly this is due in many instances, to the conflicts between the values of the home and those of the school. For example, in the lower socio-economic stratum of society, there is probably little or no value placed upon academic success. Rather, because of the struggle for existence and survival, the outstanding value held is one of economics.

What, then, does this mean for teachers? It does not mean that teachers should proceed to give moral lessons, force their value structures on students, or require students to memorize lists of desirable values. The meaning for

teachers appropriately is answered in the 1962 ASCD Yearbook. It states:

> In general, this means that we must find ways of creating school and classroom atmosphere which facilitates the process of exploration and discovery of personal meaning -- where there can be a freeing, expanding and changing of perception. Students need to have many choices; when they discover something of interest, they need to have plenty of time to work at it. Self-selection in an environment rich in materials, where students sense that how they feel and what they think are important, can be extremely effective in helping students to become more fully functioning. Through acceptance and trust, particularly, teachers play a strategic role in this learning process.[6]

What implications does the above hold for teachers of science? Simply, that a classroom atmosphere must be provided which allows for flexibility, freedom to experiment, to follow discovered science interests, with sufficient time and variety in materials to enable students to become involved in relevant learning situations to the extent that they discover who they are and what is important. In addition, there must be acceptance and trust by the teacher of each pupil. Unless this is forthcoming, the whole process will, in all probability, be fruitless.

GUIDELINES FOR QUALITY ENVIRONMENTAL TEACHING

How does an individual learn? That, of course, depends upon one's views on learning and his philosophical and psychological orientation. To one person, it may be a process of self-growth; to another, a process of social interaction; and to still another, a process of physical interaction. To one, learning might not result in overt changed behavior; to another, it is the only way to determine if learning has taken place.

The Task Force on Environment and Natural Resources feels that learning is a process whereby, through active experience, a person changes or develops new insights and understandings as he gains an increasing awareness of himself and his psychological environment. He obtains this understanding through a combination of three complimentary, interrelated processes. They are:

1. Differentiation - Process by which a person learns to perceive or discover more specific facets of himself and his environment. For example, what were once kittens came to be cats, lions, and tigers.

2. Generalization - Process by which a person learns to group a number of objects or functions under one heading. Through the differentiation of different experiences, a person may develop a generalized concept. For example, through the process of differentiation, one might divide the physical world into animal, vegetable, and mineral.

3. Restructurization - Process by which a person learns to make greater and better sense of himself and his world. This, it is the way in which one sees various relationships. As a person develops, he becomes a better thinker.[7]

For learning, as defined above, to take place, certain factors or ingredients are necessary. They are necessary if successful and meaningful learning is to take place.

Acceptance

Before meaningful learning can take place in the classroom, there must be full acceptance by the teacher of the learner. This does not mean acceptance of the fact that the teacher will be with the student for an entire academic year. Rather, it means true personal acceptance, that is, acceptance with respect, trust, and understanding and with all his weaknesses and strengths.

Because each learner is continually striving for independence, acceptance, and self-identity, he needs to have someone in whom he can confide, who values him as a person, who accepts him, and who is interested in what he has to say, in what he does and how he does it. When a teacher takes time to be a "person" and not someone with a facade, then a trusting and accepting relationship can develop.

A student learns more than science in the science classroom. He learns who he is. If a teacher views him as one to

be trusted and accepted, as one with worthy ideas, then the learner gains trust in his teacher, as well as himself. Trust and acceptance breed trust and acceptance. If a classroom possesses such an atmosphere, then dialogue and meaningful learning will take place.

If, on the other hand, the teacher is not a "real person", the student will see the facade and lack of acceptance. This only conveys to him that he is not considered acceptable to others, and in particular, the adult world.

Not only does acceptance affect the learner's sense of adequacy as a person, it provides a basis or framework upon which the teacher can better diagnose learning problems and identify needs, interests and abilities of each student. Through the dialogue which occurs with acceptance, teachers can better find out what is on a student's mind, what is of utmost importance and of little significance.

It should be evident, then, that when acceptance is manifest in the science classroom, learning becomes purposeful, meaningful, but most important, "personalized."

Involvement

An old Chinese proverb, attributed to Confucius, goes something like this:

I hear, and I forget.
I see, and I remember.
I do, and I know.

How true this proverb is today for those of us who are responsible for directing or guiding learning, particularly, in the light of recent evidence about student learning. We know that students learn ten percent of what they hear; twenty-five percent of what they simultaneously see and hear; and over seventy percent when they become involved in "doing" in order to learn. This, however, does not mean doing for the sake of doing, but rather, doing with purpose. Morris perhaps could have been giving meaning and elaborating on Confucius' proverb when he stated:

> The learner in school must be encouraged to identify with his subject matter, to identify with it emotionally so that he can announce a personal reaction to it. The teacher's function is to arouse the learner intellectually, spiritually and emotionally. Arousal in the learner will quicken his inner senses to perceive what his learning materials are saying to him; the affective centers of "sensation" will then be in a better condition to react to the materials themselves. For it is in the reaction, and not in the materials, that knowing and learning really take place.
>
> Therefore, in every subject matter a real effort must be made to involve the learner directly. He must get personally tangled up in the subject matter.[8]

This means, of course, that not only must each early adolescent be individually interested in <u>what</u> he is doing in class, but he must also be aware of <u>why</u> he is doing it. Only with this knowledge of purpose will he be able to transfer individual and group experiences in the classroom to a developing awareness of self.

By involving the student in learning, the teacher does not develop the subject matter to fit the student, but rather the student to the subject matter. It is through involvement in learning that the learner is better able to determine who and what he is.

Relevance

Meaningful learning only takes place when it is relevant to the student's needs. That is, when it provides meaning to him in terms of his own needs, abilities, interests, perceptions and purposes. In other words, to provide for meaningful learning teachers must begin with the learner and not the subject matter of science. Any student only learns what he wants to learn. Therefore, if the teacher wants to facilitate desirable learning, he must relate it to the student's goals by providing classroom experiences which will satisfy his purposes.

It is evident that, in most cases, meaningful learning must be stimulated through initial experiences which whet the appetite of the learner for learning by appealing to his interests, purposes and goals. When this is done, the teacher is beginning with the student, and not subject matter. Unless the teacher makes every effort to do this, he will find that the learner will be "turned off". He may be learning, but it will not be of a meaningful nature. Instead, it, more than likely, will be of a frustrating or degrading nature. He will

learn that school is a bore, that he cannot learn, that because he cannot discuss Bernoulli's Principle that he is inadequate. Thus, the learner's whole attitude toward science, toward himself as a person and learner is dependent upon how well his interests are aroused and to the extent they meet his needs and abilities as a person.

Problem-Solving

For years the term problem-solving has been tossed about educational circles as a desirable method of learning. Unfortunately, however, for too long it has been thought of as formalized step-by-step process including the following:

1. Statement of the Problem
2. Gathering of Data
3. Analyzing Data
4. Formulating Hypotheses
5. Testing Hypotheses
6. Drawing Conclusions

Rigid use of this method resulted not in problem-solving, but in problem-doing. Creativity, critical thinking and scientific attitudes were not fostered by this structured approach.

Meaningful learning begins with a problem to be solved, but it involves exploration and discovery of numerous approaches to the solution by the learner. It means bringing together all pertinent facts needed to solve the problem. It means searching for materials. It involves collecting and recollecting

a variety of materials, facts and ideas. It means organizing, reorganizing, evaluating, reevaluating, accepting, rejecting, seeking and searching. It means finding out for one's self by taking things apart and putting them back together. It allows for involvement of students based on needs, interests and abilities.

All students want to learn, whether they admit it or not. It is up to the teacher to provide experiences in which the early adolescent is involved in seeking solutions to problems which are relevant to his needs, interests and abilities. If this is done, his horizons will broaden and his understandings possess greater depth. Thus, meaningful learning will have taken place. More important, however, such experiences will create more needs, interests, desire and thirst for further learning.

Variety of Learning Activities and Materials

If student involvement, relevance and problem-solving are to characterize the processes of learning undertaken by the early adolescent, then there must be variety in both learning activities and materials. The activities and materials, however, must be relevant to his abilities, skills, needs and interests.

When one stops to consider how learning takes place outside of the classroom, then it becomes immediately clear why variety is essential for meaningful learning. Prior to

entering school, each of us, according to some psychologists, learned fifty percent or more of all we will ever know. The startling thing, however, is to consider how we learned. In thinking about it, you would have to admit we learned through a variety of activities -- experimenting, manipulating, making things, watching television, films, movies, listening, discussing, asking questions and role-playing with peers, just to mention a few. Yet, in some instances, by the time school age is reached, it is assumed that learning can only take place through listening. This is completely contradictory to the way we know people learn best.

Through the utilization of a variety of individual, small, and large group activities, learning can be facilitated. Such activities might include pupil-performed laboratory exercises, demonstrations, panel discussions, interviews, debates, dramatizations, field trips, television programs, projects, drawings, research papers, book reviews and reports, surveys, reading assignments, making charts, graphs, models, writing plays, skits, setting up exhibits and others. Activity, small group, individual, or large group, must not be done for the sake of activity, but as it relates to the purposes of the learning experience for the learner.

The science teacher should not provide the learner with meaningless repetition of the same experience. Rather, the teacher should encourage him to solve the same problem using a number of different activities, approaches, and materials.

Success

Equally important and essential for meaningful learning to take place is a feeling of success on the part of the learner. Success is a very effective motivator. The learner who has experienced success, in most instances, will approach a new learning experience with eagerness, confidence, and a desire to learn.

The learner who has not succeeded, however, will resist, or fail to participate for fear of further failure. Teachers must make sure that students have opportunities to excel. In doing so, they will assist each student in developing a positive, self-concept and the feelings of worth and dignity which accompany it.

The more successful the learner is, the more accepting and open to experience he becomes. When he has experienced success, he is more likely to become a better student, have a more positive attitude toward learning science, and toward his peers, himself, his teacher and his school.

If each student is truly accepted by the teacher for what he is, if he is involved in solving relevant problems characterized by variety in instructional activities and materials, then he will experience success. It is the duty of the teacher to provide him such opportunities.

ORGANIZING FOR TEACHING AND LEARNING ABOUT THE ENVIRONMENT

Since the days of the Latin Grammar School, teachers have been organizing for teaching-learning. From the Herbartian Method to Unit Teaching, educators have recognized the need for some way of organizing for learning. The term most in vogue today is unit teaching. When teachers are asked what they are teaching, they, in most cases, will indicate or reply "a unit on _____". In reality, however, many times such a unit is nothing more than a chapter, chapters, or sections in a textbook. Usually, when this approach is taken, the student is little more than a passive learner and the teacher a dispenser of facts. The classroom is teacher-dominated.

The Task Force on Environment and Natural Resources prefers another approach to organizing for teaching-learning; that is, through the use of an instructional guide. An instructional guide allows for the creative designing of teaching-learning experiences. It is advantageous to both teacher and student. It enables the teacher to determine where he is headed and how he is going to get there. It provides not only day-by-day plans for teaching, but also long-range plans.

It should be noted, however, that an instructional guide is not a teacher. It provides a plan of action to make

the science classroom a working laboratory in which the answers to "why" and "how" rather than "what" are sought.

FOOTNOTES

[1]Jerome S. Bruner, THE PROCESS OF EDUCATION, (Cambridge: Harvard University Press), 1962, p. 17.

[2]Don S. Dinkmeyer, CHILD DEVELOPMENT, (Englewood Cliffs, N. J.: Prentice-Hall, Inc.), 1965, p. 212.

[3]Charles F. Combs, "Perceptions of Self and Scholastic Under-achievement in the Academically Capable," PERSONNEL AND GUIDANCE JOURNAL, 43: 47-51, September, 1954.

[4]Allison Davis, "Society, The School and the Culturally Deprived Student," SECONDARY EDUCATION - A TEXTBOOK OF READING, Lawrence E. Metcalf, John J. Deboe and Walter Kaulfers, Editors, (Boston: Allyn and Bacon, Inc.), 1966, p. 82.

[5]Louis E. Raths, Merrill Harmin, and Sidney B. Simon, VALUES AND TEACHING, (Columbus, Ohio: Merrill Books, Inc.), 1966, p. 7.

[6]PERCEIVING, BEHAVING, BECOMING - A NEW FOCUS FOR EDUCATION, Association for Supervision and Curriculum Development (Washington: National Education Association), 1962, p. 202.

[7]Morris L. Bigge and Maurice P. Hunt, PSYCHOLOGICAL FOUNDATIONS OF EDUCATION: AN INTRODUCTION TO HUMAN DEVELOPMENT AND LEARNING, (New York: Harper), 1962, p. 176.

[8]Van Cleve Morris, PHILOSOPHY AND THE AMERICAN SCHOOL, (Boston: Houghton Mifflin Company), 1961, p. 392.

ECOLOGY AND CHILDREN

by Chester A. Lawson

Though man became a distinct species more than 300,000 years ago, his position as the dominant population in the world biotic community has developed within the last 10,000 years. Early Stone Age man was dependent on all the organisms in the community for food and shelter; he lived by hunting, fishing, and collecting berries, fruit, and nuts. Man was simply one of the many predators who at times were prey for other predators. His numbers were limited by the availability of food, by disease and predation, and by other factors that operate to balance the various populations in a community. Man was a part of nature.

Then came agriculture and the domestication of animals. Man learned to plant seeds and harvest crops. He cut down the trees of the forest to extend his pastures and croplands. He learned to manipulate and change the biotic community to his advantage: plants that grew in the way of his crops were destroyed; animals that preyed on his flock became his enemies. Food became more plentiful and man's numbers increased.

Protecting himself from heat or cold with buildings and clothing, man moved into environments to which he was not originally suited. He built villages, then towns, then cities. Slowly man changed the face of the earth. Throughout these events man has acted as though he were independent of nature and could

manipulate it with impunity. Today he is learning that he cannot in truth physically separate himself. Pollution of air, water, and soil; the devastation of scenic areas; the extermination of numerous wildlife species, and the threat of human over-population -- all have proved the fallacy of man's belief that he can do what he wants and suffer no consequences. Whether he likes it or not, man is inseparably a part of nature.

Most of us have now come to accept ecological problems as real and urgent. We are reminded to their existence almost daily in television reports, newspapers, and magazines. Campaigns have begun throughout the country to set up legislative pressure groups, and already many large corporations have made public concessions and implemented corrective measures. But all of these efforts will have little longterm effect unless there is general public understanding of the relationships among plants, animals, and the environment.

Thinking about a forest may help in understanding the ecosystem concept. A forest contains trees, of course, but it is more than just trees. Living in the shade of the trees may be many kinds of shrubs, vines, herbs, ferns, mosses, and toadstools. In addition, the forest swarms with insects, birds, mammals, reptiles, and amphibians. All of these plants and animals are tied to each other by mutual dependencies that involve food and living conditions. This multitude of plants and animals does not merely live in the forest -- it <u>is</u> forest.

But the forest is not a self-contained system: it could not persist without sunlight, water, air, and soil. The green plants need sunlight, carbon dioxide, water, and minerals in order to make food; this food helps sustain not only the plants but all the other organism in the forest as well. The plants and animals take minerals from their environment, but they also return materials to it; there is a continuous exchange between organisms and their environment. The interrelated plants, animals, sunlight, air, water, and soil constitute an ecosystem.

Usually the births and deaths in any population roughly balance each other so the size of the population remains relatively constant. If all of the offspring produced each year in a population survived, the population would increase in size to the point where there would not be enough food to support it. Population explosions of this kind are prevented by predators or parasites.

An example of what can happen when natural controls are removed comes from the story of the mule deer in the Kaibab Forest in northern Arizona. A population of 4,000 mule deer lived in the forest, feeding on small trees, shrubs, and saplings. Mountain lions, coyotes, and timber wolves, also a part of the forest community, fed on the deer. In 1906 the forest was declared a national game preserve: deer hunting was prohibited and the systematic elimination of the deer's predators was begun. The plans to increase the deer population worked all too well. In 18 years the deer population

increased from 4,000 to 100,000. The forest could not support this number of deer; after stripping the forest of every plant and tree within reach, the population of deer began to decline. In two winters 60% of the deer died of starvation and disease. By 1930 the population had decreased to 20,000. By 1942 it was down to 8,000.

Communities differ due to differences in the amounts of light, heat, and water -- factors in an environment. Plants and animals in the desert differ from those in the forest primarily because of the amount of water available; ocean communities differ from lake communities because of the relative content of salt; arctic communities differ from tropical communities mainly because of temperature.

Most organisms are able to form and reproduce within a fairly wide range of any environmental factor. Thus we might find a particular kind of plant, for example, living in any area in which the summer temperature range is from 50 to 90° F. However, there is an optimum range of any environmental factor for every kind of organism. Thus the largest and healthiest population of our sample plant might be found in an area where the summer temperature rarely drops below 70° and seldom exceeds 80° F. This would be the optimum temperature range for that kind of organism. In addition, there are ranges of light, water, and other factors, combining to produce the environment in which the population grows and reproduces best.

NATURE CREEP

The newest type of nature study.

Each person needs a hand lens or magnifing glass; preferably with a string attached to hang around the neck.

A nature creep is just as the name implies -- creeping along in a field, near a stream, in a wooded area, or in open fields -- wherever there is life of any kind.

Observe with the hand lens every leaf, rock, lichen, mushroom, flower, animal's eyes and legs, etc.

1. The dandelion. Tear it apart and look at each little part. Compare the freshly opened blossoms with a mature blossom. Look at the downy structure that carry the seeds.
2. Hold a Granddaddy Spider by the legs and observe it's eyes that stand out on stems.
3. Look at a bird's feather.
4. Look at the different kinds of tree bark.
5. Look close up at mosses.
6. Look at the wing of an insect or butterfly or at it's legs.
7. Lichens on trees, rocks, etc. (The dry gray flaky plant life.)
8. What kind of life is present in a rotten log? (Remember a rotten log is a house to someone. How would you like for someone to tear up your home?)
9. What is the function of leaf veins for a leaf?
10. Don't forget to use all your senses -- hearing and touching particularily.

Pennsylvania Forestry Assoc.

HOWDY RACCOON'S
CODE FOR GOOD OUTDOOR MANNERS

I WILL read and obey the rules for each area I visit and encourage others to obey them too.

Be safety-minded:

Never discard burning material -- matches, tobacco, etc.
Throw nothing from any height, viewpoint or trail.
Observe firearm safety rules.
Never feed or disturb wild animals.
Respect food and equipment caches.
Keep pets on a leash.
Be informed on proper first-aid and emergency rescue procedures.
Observe regulations regarding saddle and pack animals and motorized vehicles.

Never mark or damage natural features:

Gather plant life or souvenirs only with official permission.
Stay on established trails wherever possible.
Leave gates **as found.**
Build fires in designated or safe places only and obtain a fire permit if required.

Keep the outdoors clean:

Scatter no litter.
Burn completely all burnable garbage. Place unburnable refuse in containers provided, or take it home.
Keep water resources pure -- do not clean fish, dishes, laundry or self in lakes and streams.
Do not use synthetic detergents in the outdoors.
Use toilet facilities where provided. Otherwise bury all excrement.

Never damage, or tamper with signs, structural facilities or equipment.

Report all willful violators, and any damage discovered, to the nearest authority.

Appreciate and protect our heritage of natural resources and wild life.

I WILL ALWAYS USE GOOD OUTDOOR MANNERS.

GOOD OUTDOOR MANNERS ASSOCIATION, P. O. Box 7095, Seattle, Washington 98133

OUTDOOR ACTIVITIES

1. What insects grow inside plants?

   Gall insects do! They lay eggs on many parts of certain plants. As the eggs develop, a swelling - or gall - appears. Galls are most easily spotted on stems or branches. You'll find lots of galls on goldenrod. Collect some. Cover one with a piece of nylon, put it in water, and watch it.

2. Look for rotting logs or old tree stumps.

   Observe the many different kinds of organisms sharing this habitat. Sketch the different types of mushrooms growing there. Some may be poisonous. Don't handle! Gather a section of the decaying tree along with some of its inhabitants. Put in a terrarium and observe the action.

3. Can your class save seventeen (17) trees?

   Everytime 2,000 pounds of newspaper are recycled, 17 trees escape the saws! How many trees can you save? Collect and weigh all the newspapers you get at home. Compute the number of trees you save each week. Find, also, the total number of trees saved by the entire class each week.

4. Compare a mini-desert and a mini-jungle.

   Cracks in the sidewalk and shortcut paths can be deserts. Any grassy area can be a jungle. Record the numbers and kinds of organisms in each area. Check soil temperature with a thermometer. Push an open-ended juice can into the soil. Fill with water. How much water does each area need?

5. Toss a hula hoop onto a given area where life is growing. Record the organisms you see inside the hoop. How many kinds of plants did you see? Did you see more of one kind of an animal?

   Try this same activity after a heavy rain. Did you find new organisms.

6. Decay, rust and weathering are important kinds of change. Without these processes many minerals and other matter could not be returned to the soil.

   Make a tour of your area to find evidence of these processes of change. Look in damp areas for rotting wood, molds and fungi, dead and dying plants. Look in junkyards, near abandoned buildings, and on bridges for evidences of rust and weathering by water, cold, and heat. Visit a farm to find out how a farmer makes use of decaying matter.

7. Investigate the effect of rain on bare soil, grassed areas, and a garden area.

   1. Staple 3x5 cards lengthwise to ice cream sticks to make "splashboards".

   2. Just before a rainstorm stick the "splashboards" in the following places:

      a. an area of bare soil

      b. a thickly planted lawn

      c. a sparsely planted lawn

      d. a flower bed

      e. a weedy field

   3. After the storm collect and label the cards. Note the kind of rainfall (heavy, light, drizzle, etc.), length of storm, and area where "splashboards" were placed.

   4. Repeat the process for another storm.

   5. Compare cards. During which storm was the most soil splashed away? Which area lost the most soil? Which lost the least? Why?

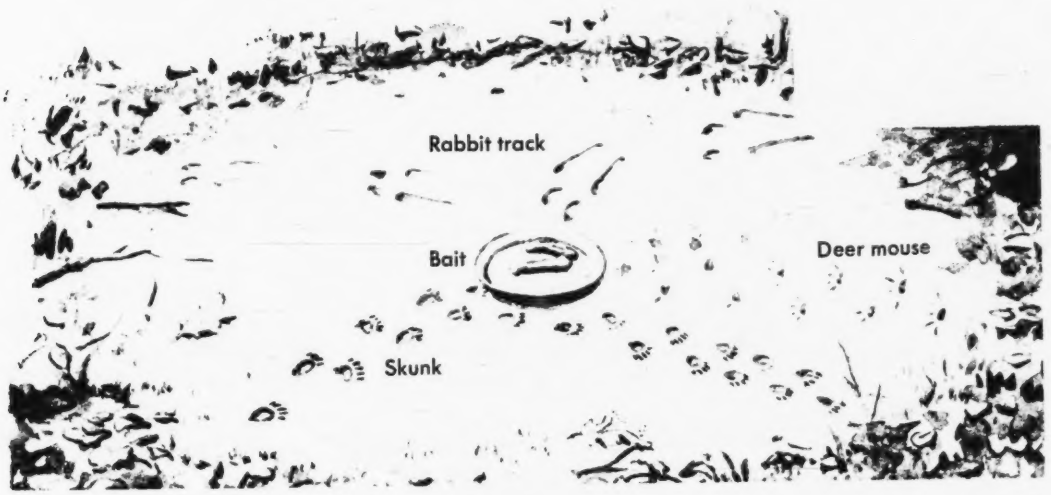
NOCTURNAL ANIMALS

(Ones that sleep in day time
and travel at night)

Nocturnal animals live almost everywhere, even in large cities. To find out which ones live in a given area, remove everything from a circle of ground several feet across. Dampen the soil and rake it until it is very smooth. Place some bait in the center and look for tracks in the morning.

Use mammal guides or Audubon Nature Bulletin (Tracks of Mammals) to identify the tracks.

If dogs and cats are a problem, try bait that does not interest them, such as corn meal, sunflower seeds, fruit, or peanuts.



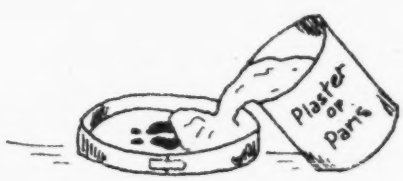
PLASTER CASTING
ANIMAL TRACKS

Materials: Plaster of paris, water, vaseline petroleum jelly, a strip of cardboard 2" wide, paint, and tape

Construction:

1. Place a 2" cardboard collar (coated on the inside with vaseline) around the track, and lightly sprinkle talcum powder into the track.

2. Mix the plaster of paris and pour it into the track. Allow at least 30 minutes to dry.



3. Loosen the ground around the track, and remove enough dirt to carry the negative cast home. Let it dry overnight before removing the rest of the dirt.

4. After cleaning, coat the negative and the inside of another collar with vaseline. Attach the new collar to the negative.

5. Mix plaster of paris and pour into negative mold. Allow at least 30 minutes to dry.

6. Remove the collar and carefully separate the cast from the mold. Paint the track to make it more distinctive.

PENNSYLVANIA OUTDOOR EDUCATION RESOURCES CENTER
112 Recreation Building
University Park, Pennsylvania 16802

THE TIN CAN BAROMETER

The Tin Can Barometer is used to measure changes in air pressure.

MATERIALS: One tin can, a broom straw or soda straw, a rubber band, a piece of saran wrap (large enough to cover the top of the can), a piece of scrap paper, and a paper clip.

CONSTRUCTION:

1, Place saran wrap over the top of the tin can and hold tight with the rubber band.

2. Wrap the paper around the can so part of it is higher than the top of the can, and staple in place.

3. Attach straw to the middle of the saran wrap with glue or tape.

4. Mark the position of the straw on the paper with a paper clip, and watch to see if the straw moves up or down.

If the straw moves toward the high, the weather will be fair.

If the straw moves toward the low, there is a storm coming.

INSECT COLLECTING NET

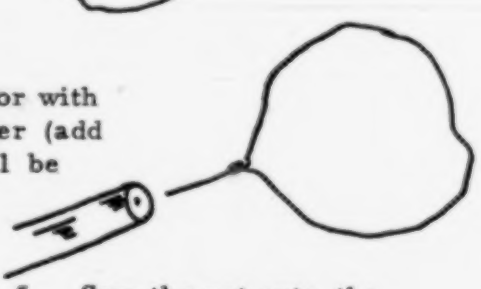
Materials: A coat hanger, a broomstick about four feet long, a piece of cheesecloth three feet wide and two feet long, and some heavy thread.

Construction:

1. Bend the coat hanger i into a circle.

2. Straighten out the hook part of the hanger

3. Make a hole in the end of the broomstick either by drilling, or with a nail, and insert the coat hanger (add a little Elmer's glue and it will be more permanent.)



4. Fold cheesecloth in half and sew up the top and side to form the net.

5. Sew the net onto the wire coat hanger.

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ENVIRONMENT AND ECOLOGY

Making a Diorama

Objectives:

1. To help students better understand the concepts of environment and ecology.
2. To help advance skills in sketching, painting, modeling and manual training.

Procedure:

1. Simple but effective dioramas are made from shoe boxes or cartons. The background may be painted directly on the bottom and sides of the box which will serve as the background area, or it may be painted on cardboard of the appropriate size and placed within the box.
2. Build up the foreground base with crumpled paper towels and cover with a mixture made of 4 parts Plaster of Paris, 3 parts ground asbestos, 2 parts Dextrine and 1 part Whiting. Mix this with water in an enamel, glass or plastic container -- don't use a metal one. Smooth the mixture over the foreground with a palette knife or wet fingers. While still damp, paint it ground colors with tempera, or sprinkle sand or soil over it for a realistic effect. Set all items for the foreground in this mixture while it is still wet. After about three hours it will become as hard as cement and will make an indestructable base.

3. Countless materials are used for foregrounds. Trees may be made of twigs with rubber sponge for foliage. Paint the sponge green, or red or yellow for autumn scenes. Dried grasses and raffia make good marsh plants. Dried statice and everlasting flowers make beautiful little gardens. Ponds are made with small mirrors. Mammals, and other animals, buildings and people are modeled from clay or carved from balsa wood.

Materials needed:

1. Shoe boxes or cartons.
2. Paper towels.
3. Plaster of Paris, ground asbestos, Dextrine and Whiting (from building supply house or art store).
4. Water.
5. Enamel, glass, or plastic container.
6. Tempera paint or sand or soil.
7. Twigs, rubber sponge, dried grass, raffia, dried statice everlasting flowers, small mirrors or pieces of glass, clay, etc.

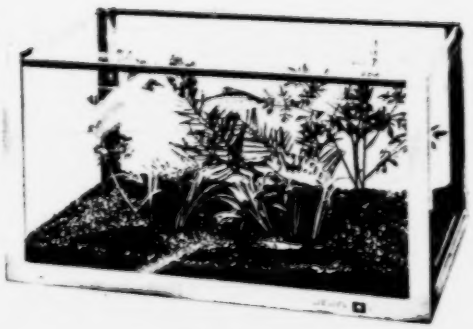
Activity

Divide the class into four groups. Let the four groups represent the federal government, the local community, the industry, and the individual citizen to discuss questions like:

1. Whose job is it to stop air and water pollution?
2. What special responsibilities does each group have toward air and water control?
3. Which is our most serious problem - air pollution, water pollution, or land pollution?
4. Under the assumption that current sources of pollution are not controlled, who should be responsible for setting up the following restrictions?
   a. A restricted amount of water per day, per household.
   b. Limited use of private transportation.
   c. Limited use of power tools- kitchen, workshop, yard, etc.
   d. Elimination of power lawn motors.
   e. Limited use of electricity per day, per household.
   f. Limitation on family size.
   g. Limitation on the size of living quarters.

Making a Terrarium

Place gravel one inch deep in bottom of an aquarium or flat-bottom jar and put several small pieces of charcoal in the gravel to absorb impuritives. Place several inches of rich soil over the gravel and moisten it well. Among the small woodland plants which grow readily in a terrarium are winter-green, tiny ferns, cinquefoil, peppermint, moss and pipsissewa or (Wild orchid or rattle snake plant). An acorn or two may be placed in a high sided terrarium. To retain the moisture, cover the top with glass or plastic and set the terrarium where light (not sunlight) will reach it. Small toads or newts in the land stage, live well in a terrarium that includes a small dish "pond."



The One Ten-Thousandth of an Acre Hoop

The use of the 1/10,000 of an acre hoop can be the starting point for lessons in various curriculum areas. Even the development of the hoop offers students the opportunity to have a direct learning experience in the computation of the area, radius and circumference of a circle.

If it is within the capabilities of the students, have them figure the area and circumference of one ten-thousandth of an acre. If 43,560 square feet is the area of an acre, then the area of 1/10,000 becomes 4.356 square feet. By using the formulas, $A = \pi r^2$ and $C = 2\pi r$, the circumference of the circle can be figured. Therefore:

$A = \pi r^2$
$4.356 = 3.14\ r^2$
$1.387 = r^2$
$1.17771 = r$

$C = 2\pi r$
$C = 2\ (3.14r)$
$C = 6.28\ (1.17771)$
$C = 7'\ 3.96''$ or $88\ 3/4''$

Lengths of clothes line wire can be cut to 88 3/4" and taped in a hoop. (Add an extra inch for overlap.) This circle can then be divided with twine into four quadrants.

ACTIVITIES: Ecology and Plot Study

For a general survey of an area, divide the class into groups of five. Have the students toss their hoops on areas of the school grounds or in a park. With a student working in each quadrant and one recording the information, have them count the number of things they find. At this time it is not necessary to identify everything by name. Interest should be in numbers and varieties. Vegetation, animate and inanimate items should be counted and classified. Later the class can compile and compare their samplings.

This study lends itself to the four principal concepts of Ecology (Diversity, Interrelationships, Adaptation and Change) as stated in the Grade Teacher, January, 1969. By becoming aware of the large quantity of small things which make up our environment, students can better understand what is meant by Diversity.

Through an awareness of Diversity, the students can begin to understand the Interrelationships of all things. Why were there more worms in one area? What was in that area that another area lacked? Because of the worms, was the soil any different? What possible difference does it make? What are the consequences of man's activities in the area?

After noting the differences and Interrelationships, students might begin to understand Adaptation and ask, "1. What attributes of this particular animal, insect, or plant make it possible for it to live in this particular environment? 2. What aspects of this particular environment make it possible for this particular

animal, insect or plant to live here?" (Grade Teacher, Janua ry, 1969, p. 112) Do plant roots spread out or go straight down? Why?

The fourth ecological concept, Change, can be discovered by conducting the hoop count in the fall and again in the spring. What obvious changes have taken place in the area? Trees cut down? Field cultivated? Grass mowed or paved? Count the items near the fall count and compare totals. Why have some plants diminished in number while others have increased? What happened to all the acorns and fallen leaves? What new plants and insects have come in?

ACTIVITY: Mathematics.

After tallying all the numbers of plants, animals, insects and non-living things, have the students project the number of varieties in an acre. Each group should total the four quadrants in their hoop and add four zeros. This would be the total for the acre if their hoop was exactly representative of the area. To get a more accurate picture, have the groups add all their totals, divide by the number of groups and add four zeros to each variety.

To aid the students in understanding the size of an acre, have them stand on the 90 yd. 27 inch line of a standard football field. The larger part of the field is equilivant to an acre. (A=lw: A=90 3/4 · 53 1/3 yds: A=4,840 sq. yds. or one acre) Consider the Louisiana Purchase where approximately 82,762,880 square acres of land was purchased for $15,000,000.00 or about eighteen cents per acre. Compare this cost with an acre of land in your area now. What is the percent of increase?

ACTIVITY: Language Arts

Two areas of language arts which can be developed here are accurate reporting and creative writing. Recording the data collected from the count and reporting them to the class demands accuracy. Descriptions of the variou items found in the hoop must be co mplete enough to later identify.

Creative compositions and tall-tales can be written about the area examined. A blade of grass telling why he is taller than the rest, a snail shell telling his life's story or an acorn reflecting on the different directions his life might take are some of the ideas which may arise.

ACTIVITY: Conservation.

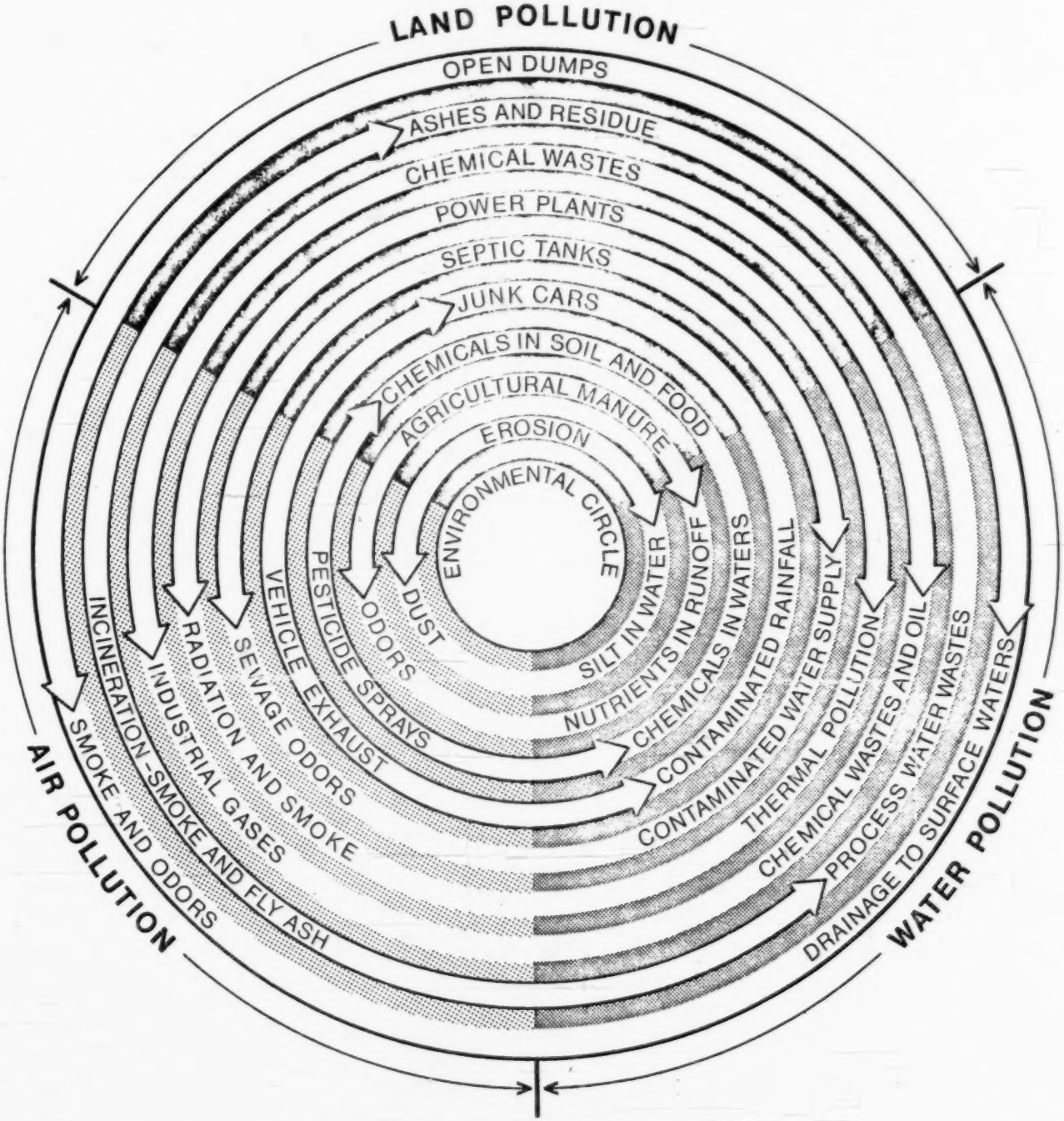
To demonstrate the problem of litter, have the students toss their hoops in a littered area around theschool ground and have them pick up every scrap of trash in the circle. The trash can be weighed and the projected total of the a mount of litter in the school grounds can be made. A weekly clean-up of a given area can lead to a yearly projection of litter accumulating just on the school grounds. What does it cost theschool, town and state for litter clean-up annually?

As a graphic demonstration of how bad litter can be, secure permission to display the litter in the school lobby or a display case.

To demonstrate what litter can do to water, place the trash from one quadrant in a gallon jar partially filled with water. Close the jar and open it again after three days, a week, ten days and two weeks. What do the contents of the jar smell like each time? What physical changes have occured in the litter? the water? What relevance does this have to the rivers and lakes that are now dying?

ENVIRONMENTAL CIRCLE

SHOWING MANY KINDS OF POLLUTION AND THE EFFECT ON THE TOTAL ENVIRONMENT



NEW YORK STATE DEPARTMENT OF HEALTH

NATURAL AREAS

ALL NATURAL AREAS SHOULD REMAIN UNDISTURBED

ALTERNATION OF SUCH AREAS SHOULD TAKE PLACE ONLY AFTER ADEQUATE STUDY AND EVALUATION

Each area has immediate value as a laboratory in which children can observe stages of succession in plant growth and animal populations

WHAT IS THIS THIS THING CALLED SUCCESSION?

SUCCESSION IS THE NATURAL CHANGE THAT OCCURS IN VEGETATION OVER A PERIOD OF TIME AS VEGETATIVE TYPES CHANGE ANIMAL SPECIES ALSO CHANGE

VARIOUS STAGES OF SUCCESSION MIGHT BE FOUND ON YOUR SCHOOL SITE

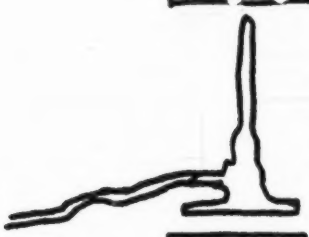
BUILD YOUR SCHOOLS TO FIT THE SITES

OPEN FIELD SHRUB FOREST BARE GROUND

NATURAL WAYS TO USE NATURAL AREAS

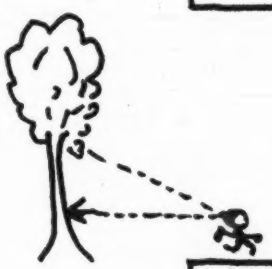
SCIENCE

1. FOOD CHAINS
2. LIFE HISTORIES
3. PLANT & ANIMAL SUCCESSION - ECOLOGY
4. SOIL & WATER SCIENCE



MATH

1. DETERMINING HEIGHT & DIAMETER OF TREES
2. DETERMINING BOARD FEET OF LUMBER IN TREES
3. SAMPLING - RATIO
4. SURVEYING

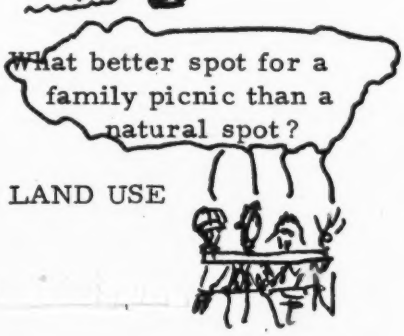


ART

1. APPRECIATION FOR THE NATURAL SCENE
2. FALL COLORATION
3. DESIGN
4. SKETCHING

SOCIAL STUDIES

1. LOGGING
2. LAND USE HISTORY - LAND DESCRIPTION
3. WATERSHED STUDY in LAND USE
4. DRAINAGE SYSTEMS



BIBLIOGRAPHY

BROWN and MOUSER: TECHNIQUES for TEACHING CONSERVATION EDUCATION: BURGESS PUBLISHING COMPANY; MINNEAPOLIS, MN

WEAVER, OUTDOOR LABORATORIES; INTERSTATE PRINTERS and PUBLISHERS; DANVILLE, ILLINOIS

A Fishless Aquarium

Hours of intriguing investigation result from a simple pond water aquarium. Children are fascinated by the creatures found in pond water and can easily become familiar with them. As children compare jars of pond water and, later, the water from different ponds, they begin to understand that living things are different in different environments.

Material for a fishless aquarium can be collected on a class outing.

In preparation for the outing, ask each child to bring a one-quart milk carton and a one-quart clear glass or plastic container. Take the milk cartons on the outing. Each child will collect a sample from the pond, ditch or lake visited.

Collect material this way:

1. Carefully unfold the top of the milk carton so you have a square opening. Rinse out all traces of milk.

2. Take the milk carton to the pond, lake or ditch. Scrape a little mud off the bottom and into the milk carton. You can use the milk carton to scrape with. If you scoop the mud up with some other container, be careful not to wash away creatures contained in it .

3. Measure the depth of the mud you have scraped into the carton. Poke your finger into the mud and make the level of the mud the same as the height of the first joint on your index finger.

4. Fill the rest of the carton with clear water.

5. Add a small handful of any dense water plant that is available. Many animals live in the plants and will be transferred to the carton with the plants.

6. Refold the top of the carton. You may tape or staple the top together before carrying it away.

7. Dump the sample from the carton into the quart jar. Rinse the carton by pouring some water from the jar back into the carton. Shake the carton with the water. Then pour the rinse water into the jar. Don't worry about how cloudy the water is. It will settle and clear if left undistrubed for several days. If jars are set in windows, plants will stay healthy.

8. Shake the plants free of mud.

After the mud has settled, children can study the jars' contents closely.. ....now the fun begins:

1. Are there creatures swimming in the water of the jars?

2. Are there creatures on the sides of the jars?

3. Are there creatures on the surface of the mud?

Microscopes or magnifiers can be brought out when the children have exhausted the observations they can make with their eyes. If you only have a few microscopes these might be placed in a quiet corner of the room where the children can go after finishing other work.. Encourage them to record their observations with pictures and words. These might be put on a bulletin board.

The class may observe the creatures in their jar for quite some time before they will raise such questions as the following. Be patient! These questions will be raised by the children as a natural follow-up to their observations.

1. Does my jar have the same creatures as everyone else?

2. Does my jar have as many creatures as someone else?

3. Is the population changing in my jar? Is the number of one creature increasing or another decreasing?

4. Is the color of my water the same as everyone else's?

5. Is my mud the same as everyone else's?

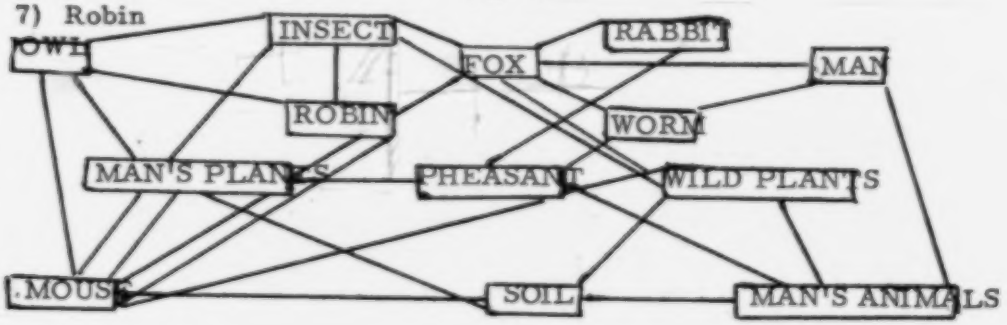
These aquariums will last for several weeks. To assure this, some precautions should be taken. (1) Don't add food to the water! (2) Keep some distilled water on hand to add as the pond water evaporates. (3) Keep the jars in the coolest part of the room. (4) If there are some green plants, keep the jars in the light.

THE FOOD CHAIN GAME - THE WEB OF LIFE

Purpose: To demonstrate the interdependencies that exist among all living things--including man: that all life depends upon soil, water, air, and sunlight; that predation is a way of life for many animals; that man may affect other forms of life by his management or mismanagement of soil, plant life, and animal life.

Equipment needed: A ball of string and a pair of sheers. Several signs with strings attached so that they may be worn around the neck. On these signs, letter or draw the following characters:

1) Soil
2) Man's plants
3) Wild plants
4) Man's animals
5) Worm
6) Mouse
7) Robin
8) Rabbit
9) Pheasant
10) Owl
11) Fox
12) Insect
13) Man



How to do it: Tell the children that today they are going to play a game which will show them how plants and animals depend upon soil, water, air, and sunlight. Let a glass of water and a deep breath represent the "air" and "water" requirements for life. The ceiling lights or a flashlight will represent the sun. The game may be simple or elaborate.

Starting with "soil" and continuing through "man", the children are brought into position one at a time as illustrated. After each enters the game, the strings are stretched between the new individual and his food-chain partners. Encourage the children to tell where the strings should go.

When all of the strings have been run, ask students if it looks like a spider web; that is why we call this the "web of Life". Have "man" drop his strings. What creatures are affected by man's disappearance? Repeat this, having "mouse" drop his strings. Are any other animals affected? Finally, what happens when "soil" disappears?

This is visual education and may be very effective in expressing several concepts.

Living Calenders

In 1958, Joan Kirk watched as a flock of migrating warblers died in an orchard that had been sprayed with DDT. The sight convinced her of the need for alternatives to synthetic pesticides, and she has spent the last 13 years persuading others that the purpose of gardening is to create, not to kill. Now she has gathered her suggestions for organic gardening into a year-round guide, "The Living Garden: An Environmental Calendar."

Some hints are familiar: Purchase ladybugs, which eat aphids, by mail (RIGHT NOW, June, 1971). Other suggestions are more surprising: Plant white geraniums, which will attract---and stun----Japanese beetles. They're then easy to pick off and destroy, Mrs. Kirk explains. Her bigorous, attractive garden in Virginia is living proof that such biological controls are effective. "You won't grow the perfect rose this way," she says. "But you'll grow a good rose, and you won't kill anything else doing it." Her tulips and crocuses are planted in clumps around garlic plants which, she says, repel mice and moles. The woods surrounding her house are rich with natural predators, and she encourages birds with comfortable houses.

The calendar is timed for seasonal problems as they occur in the temperate zone. But Mrs. Kirk, who is herself a native of California, says the suggestions are of use at some point in the year throughout most of the continental United States. All her recommendations have been reviewed by leading botanists, entomologists, and horticulturists.

The 9-by-12 inch wall calendar is published jointly by the Audubon Naturalist Society of the Central Atlantic States, and Concern, Inc. The two organizations will share the proceeds and use them to further research and education projects in environmental areas. "The Living Garden" is available for $3 ($2.50 each for orders of 10 or more) from CONCERN/ANS, 2233 WISCONSIN AVENUE NORTHWEST, WASHINGTON, D.C. 20007.

A FIELD OF INSECTS

You are a lucky group if you have open, grassy fields available. During the spring, summer and fall, different plants come into blossom, go to fruit or nut, and then die off. During these stages, insects visit the plants for a variety of reasons. A study of insects that visit the blossoms can be made with an insect net. There are many plans in science books for the construction of insect nets. You can make your own nets using one of these plans. Otherwise, ready made insect nets can be purchased from biological supply houses for as little as $4.00 each.

When the field is in bloom the students may sweep certain flowers (all of one kind) with the nets. Warn them that they may not see the insects until they are in the nets.

Make a simple killing jar by simply pouring about three tablespoons of denatured alcohol into a plastic bag and closing it with a wire twister. (A solvent-cleaner like Synasol works well as a killing solution and is inexpensive. It's available in hardware and paint stores.)

To mount the insect collections, give the students heavy paper or cardboard and white glue. Allow insects to dry before mounting. Mount each insect by placing a drop of glue on the paper, place insect on top of the glue and gently settle it into the drop. Glue dries almost clear. The insect is visible and probably in better shape than if ten awkward fingers had tried to pin-mount it.

A pressed, dried sample of the bloom to accompany the insect collection is valuable. Press the flower in newspaper beneath heavy books for one week (longer for their petals). Place a square of transparent plastic food wrap over the flower and tape to a flat surface.

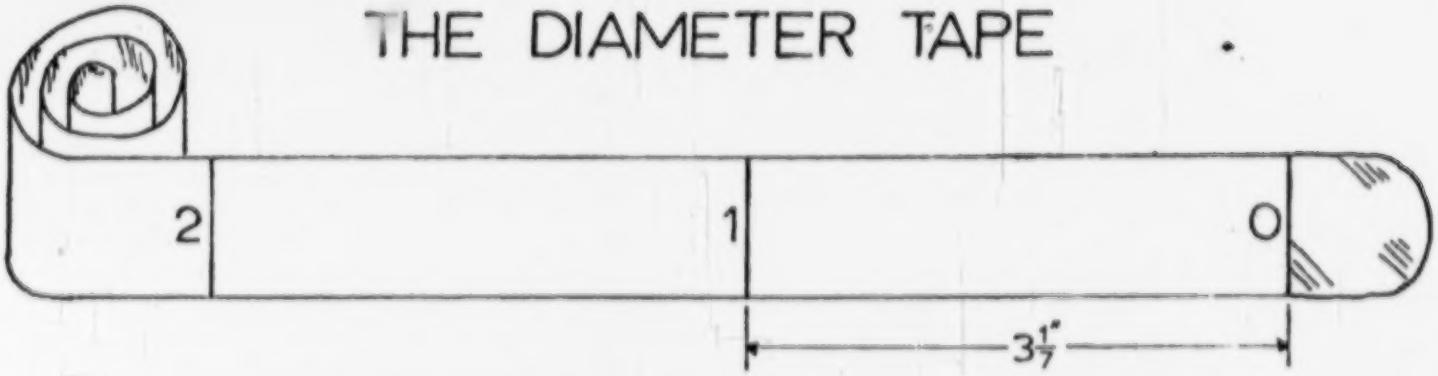
If there are several flowers (weeds, bushes, grasses, etc.) in bloom at the same time repeat the sweeping procedure on each flower. Be sure to keep collections separate, dated and labeled!

Later in the season still other flowers will appear. As each plant blossoms, it should be studied by the class. A series of collections for each blossoming plant can be made for the field.

Questions which will arise as the class studies the collections include some of the following:

1. Is there one kind of insect which is found in great numbers for each blossom?

THE DIAMETER TAPE



The DIAMETER TAPE determines the diameter of trees

MATERIALS: A tapelike material, or two pieces of masking tape back to back

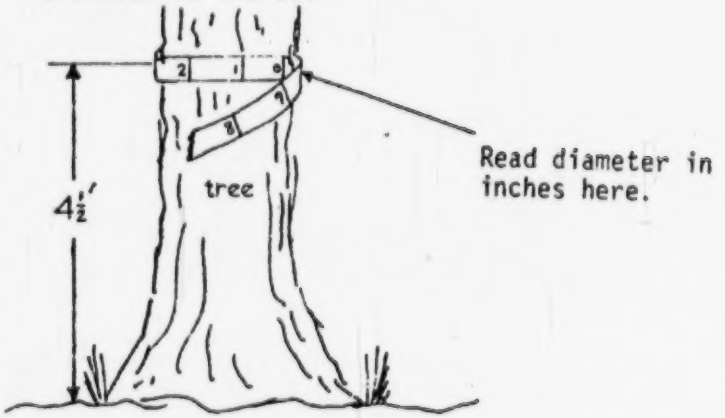
CONSTRUCTION: Mark the tape off in $3\frac{1}{7}$ inch sections, as many as you wish

Why $3\frac{1}{7}$ inch sections? It is found if you wind paper around a stick 1 inch in diameter, this paper is $3\frac{1}{7}$ inches long (try it). So every 1 inch diameter of a circle is equal to $3\frac{1}{7}$ inches circumference.

This $3\frac{1}{7}$" is a constant, it never changes, and is usually written with the greek letter π (pi) usually pronounced like "pie", in the formula $C = \pi D$

Where:
C = Circumference
$\pi = 3\frac{1}{7}$
D = Diameter

Wrap the tape around the tree trunk $4\frac{1}{2}$' above the ground. Where the tape meets, read the diameter in inches.



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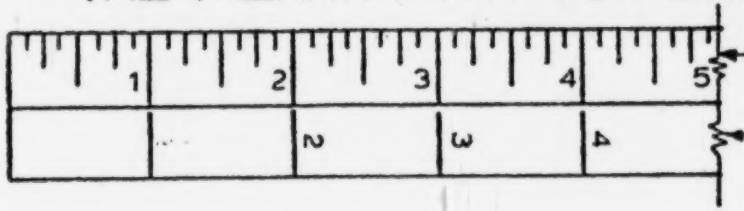
THE MERRITT HYPSOMETER – FOR ESTIMATING HEIGHT



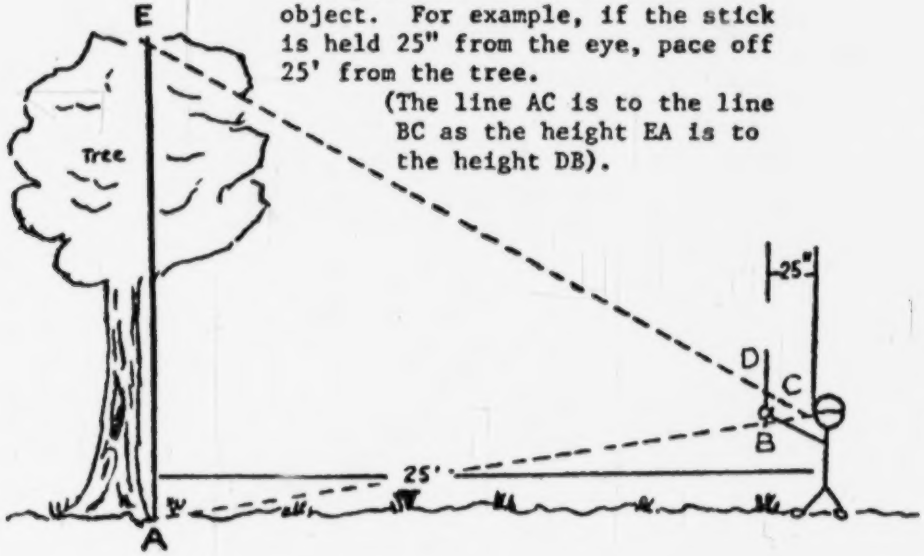
Top half of a yardstick

Cover the lower half of yardstick with masking tape and extend inch markers so they can be read when the stick is held vertically. Label.

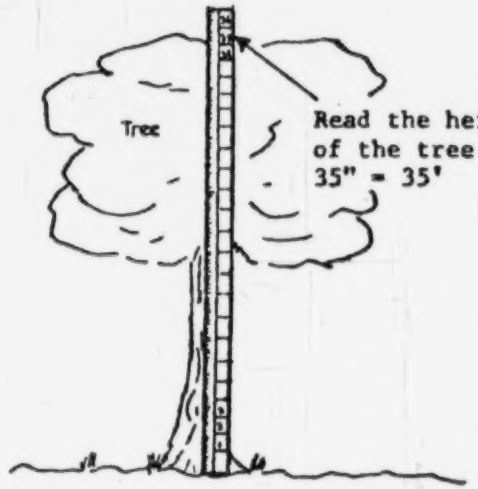
MATERIAL: A yardstick or similar piece of thin wood, masking tape.

PRINCIPLE: The Hypsometer works on a ratio of 1 inch to 1 foot. To set up the ratio, two similar triangles must be formed. One triangle is with the eye and stick (DCB) and the other is with the eye and the object to be measured (ECA).

USE: 1. Hold the stick at arms length and measure the distance from the eye to the stick in inches. For every inch pace off one foot from the object. For example, if the stick is held 25" from the eye, pace off 25' from the tree.
(The line AC is to the line BC as the height EA is to the height DB).



2. Holding your head steady, read the height in feet.



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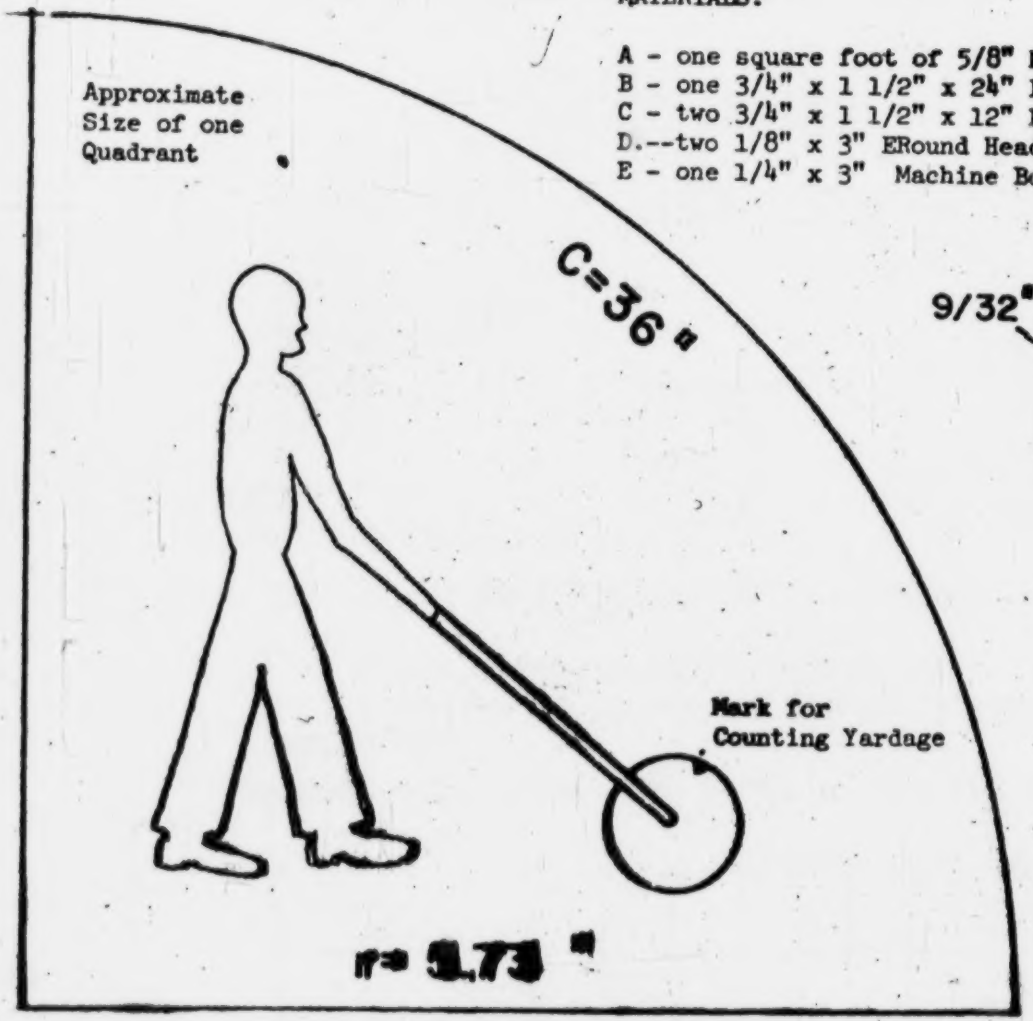
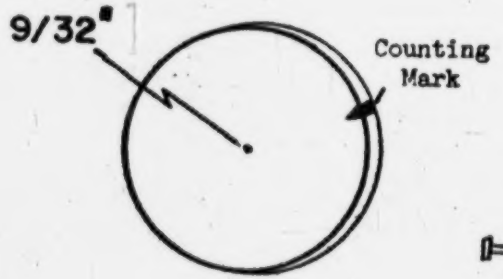
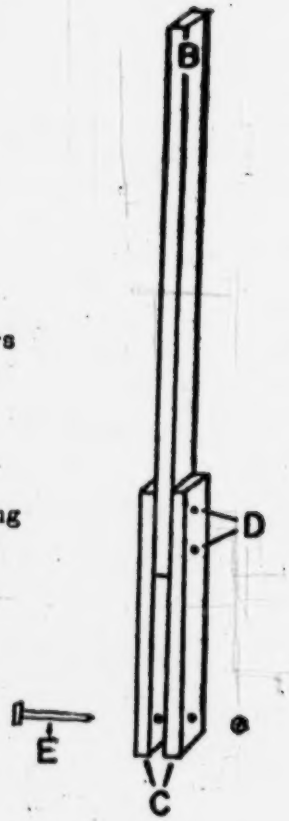
MEASURING WHEEL

MATERIALS:

A - one square foot of 5/8" Marine Plywood
B - one 3/4" x 1 1/2" x 24" Board
C - two 3/4" x 1 1/2" x 12" Boards
D.--two 1/8" x 3" ERound Head Stove Bolts with Washers
E - one 1/4" x 3" Machine Bolt with Nut and Washers







Idea Adapted From Elizabeth Roller
Consultant in Outdoor Education
Nashville, Tennessee

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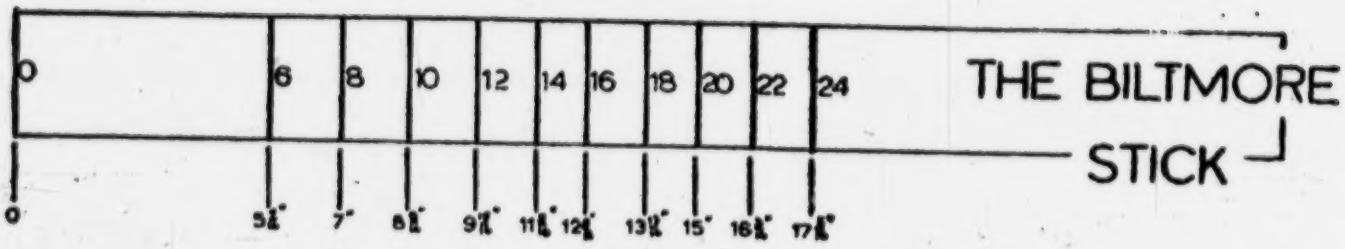


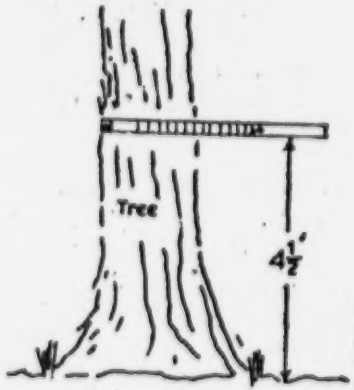
MATERIAL: A yard stick or similar piece of thin wood, and masking tape

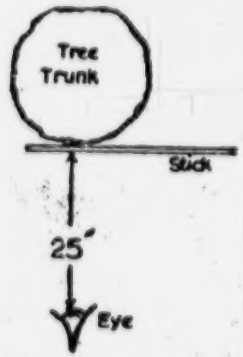
CONSTRUCTION:

1. Place tape over the back of the yard stick or piece of wood
2. Mark off spaces from 6 to 24 using the measurments as seen in the above diagram

The BILTMORE STICK is used to estimate the diameter of trees

1. Hold the stick horizontally, about four and a half feet from the ground.





2. Hold the stick against the tree, about 25 inches from your eye.

3. Hold your head steady, and line the "0" up to the outside of the tree.

4. Glance at the other side of the stick. The line that lines up with the outside of the tree indicates the diameter.

1-REMEMBER-Do not turn your head while glancing

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Natural Selection UponToothpicks

A child most often comes to regard the appearance and behavior of a plant or animal as something of that organism's own choosing. The plant grows a beautiful flower because it wishes to be beautiful. The cat stalks the bird because the cat is naughty. The fish come to the edge of the aquarium because they want to be fed. Cattails grow in the pond because they like the water. The trees grow tall because they need the sun.

Our problem is mainly one of language and over-simplification. Our language developed to express ideas and information from a human point of view--from a point of view that assumes that humans make decisions and choose all their actions. Perhaps it is accurate to say, "John puts on his coat because it is cold outside." This implies that John chose this action and this is probably realistic. However, we run into some trouble of confusing a child's understanding of reality when we use the same language to refer to the behavior of something other than human. To say, "The horse puts onhis winter coat because it is cold outside" is not wrong, but it is not realistic either. It states a situation about a horse in the same language we used for John, and to the child, this implies that the horse also chose its action.

We may never get away from our language problem. But why not use some other means to communicate the reality of an organism's situation. Activities allow children the potential for a greater latitude of insight than verbalized instruction. The following is an activity which deals with a concept that is often misrepresented by verbalized instruction.

Background

Most insects that live on plants are green or grayish in color. Ask children to recall insects they have seen and what color they were. The children will not remember the color well, but rarely will the insect be a species which is green. The children may assume that most plant insects are not green. However, they are probably just not seeing the green ones.

Insects that live on the ground are usually brown or black. The children may agree here. But most insects that live on the ground are very tiny (pinhead size). The ground insects that children know are large. To resolve all this we can state verbally, if we must, "The insects are green or small so that we won't see them", and we will be linguistically logical, but realistically quite wrong. We imply again that the insects choose to be green. The more realistic statement is, "The insects are green because we haven't seen them (or because they haven't been seen)", but this doesn't make sense to us, let alone to the children. That is, it doesn't make much sense spoken, but it does make sense in practice. Therefore, let's not try to explain it in words, but have children learn it by experience. The following is an activity which will demonstrate what we haven't been able to explain above.

Natural Selection Upon Toothpicks

(Adapted from Grade Teacher, January, 1969, p. 105 and David J. Kuhn, The Science Teacher, January, 1969, p. 68)

Materials: food color or tempera paint (green, yellow, red, brown, black)
box of toothpicks
plastic bags

Color equal proportions of the toothpicks each of the colors plus no color or the natural white color of the toothpick. Dip the toothpicks in the color, then let dry. Mix the toothpicks together. Then, before class, scatter them widely over some one selected outdoor area, such as a lawn, open dirt, playground, leaf litter, under trees, sidewalk, etc. Work the toothpicks into the grass or litter.

Present the activity as a game to the children. They will play the part of birds who are hunting insects for food. They can't use their hands to feel for food (birds don't have hands), only to pick up what they see.

Show the children what the insects will look like. Show them a sample of each color of toothpicks. Give each child a bag.

Take the children outdoors to the "insect" hunting site and let them go to work. Call time after five or ten minutes. The children should carry the collected toothpicks in the bags. The children can record the respective number of toothpicks on a chart of their own.

In class, or outdoors if it's nice, tally up the number of each color toothpicks collected by the whole class. Record this on a large chart.

Generally, if you scattered the toothpicks widely enough and called time soon enough, and if one or more of the colors matched the collecting site, there should be a difference in the numbers of toothpicks in different color groups. In green grass there will be obviously fewer green toothpicks recovered, etc. because they will be more difficult to see and find.

If the toothpicks are insects and the children are birds and the birds keep hunting for insects all season, the children should be able to offer their own hypotheses (based on the toothpick collecting only) about which color insects will most likely still be left at the end of the season.

If you started with the lawn, do the children's hypotheses hold for other areas such as those listed above? Test it out. Use the same proportions of toothpicks on dirt or the sidewalk, etc.

Can the children predict what color insects can most easily hide in the other area? How do most insects living on plants come to have a green color?

EMPHASIS ECOLOGY

1. The origin of the word "ecology."
2. The interrelation of all things, living and non-living.
3. The effect of changes on the environment.
4. Examples of interrelationships in the environment.
5. The parts of the non-living or abiotic environment.
6. A definition of ecology.
7. Examples of a population.
8. Examples of the community.
9. The concept of the ecosystem.
10. The earth as a biosphere.
11. Sources of energy.
12. The role of the producer and examples of producers.
13. Examples of the role of consumers.
14. Terms to further classify consumers.
15. The three points of view used to study the ecosystem.
16. Food chains and the organisms that fill the various roles.
17. The food web.
18. The position and function of decomposers in a food web.
19. The flow of energy.
20. The two laws of thermodynamics.
21. How these laws affect man.
22. The flow of nutrients or biogeochemical cycles.
23. The Carbon Cycle.

24. The Nitrogen Cycle.

25. The dangers of pesticides.

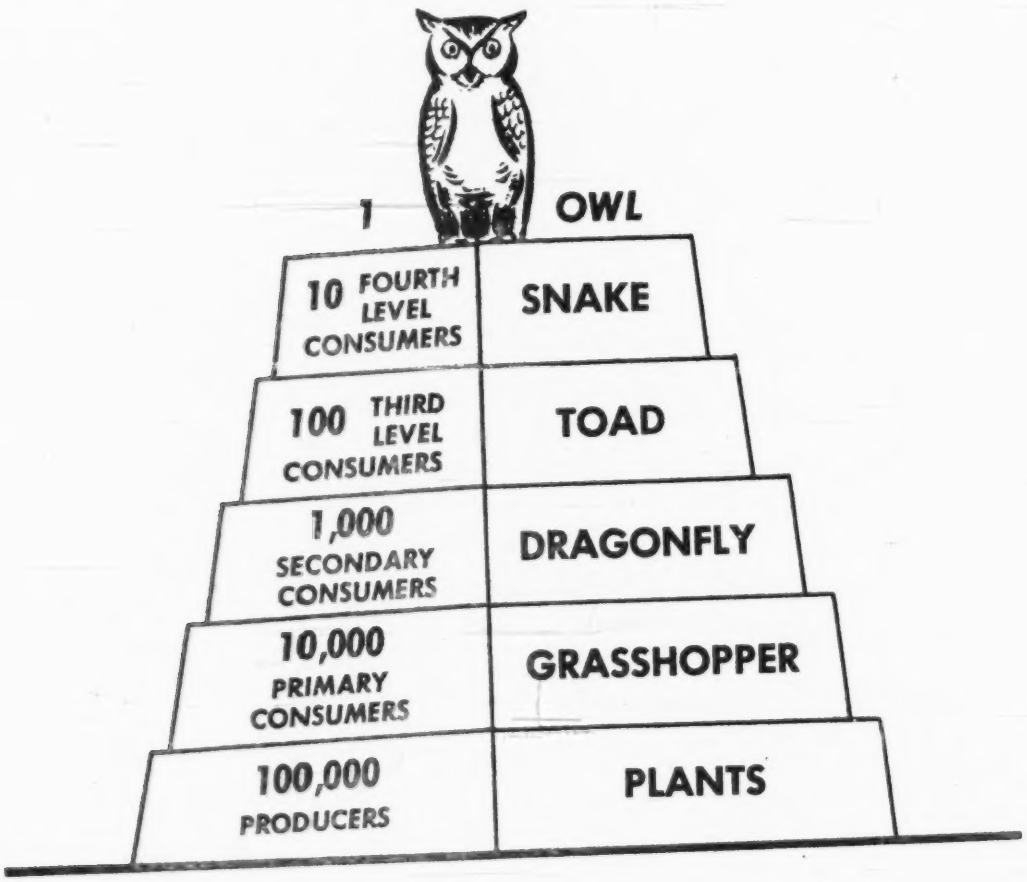
26. The Phosphorus Cycle.

27. Organisms that help in the biogeochemical cycles.

28. The Law of Minimums and examples of it.

29. The Law of Maximums.

30. The Law of Tolerance.



SAMPLE DIAGRAM OF A NUMBERS PYRAMID

WHAT'S IN A GOLDEN ROD GALL

It's the Stalk with the Swelling

The tall, common golden rod plant remains standing through the winter, though it is dead and dry.

You find it in, or at the edge of, open meadows and fields.

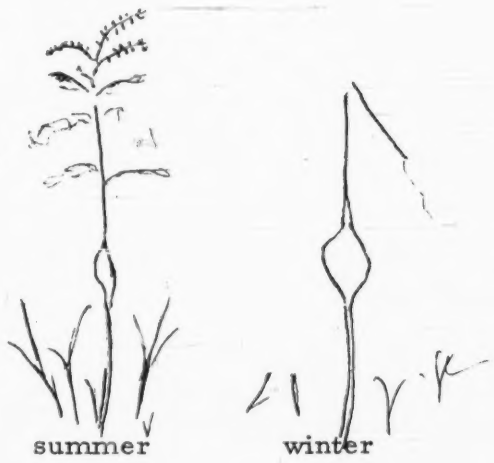
Often the dry plants have an egg-shaped swelling on the stem. This is the golden rod gall.

A Wasp Starts the Gall

The gall swelling is caused by the golden rod wasp which lays its eggs in the stem during summer, when the plant is green and growing.

The egg, and larva hatches, irritates plant tissues which swell, forming the gall.

The inner lining of the gall serves as food for developing wasp larva after it hatches from the egg.



CHECK These Spots for Galls:

Hunt for golden rod galls during February or March.

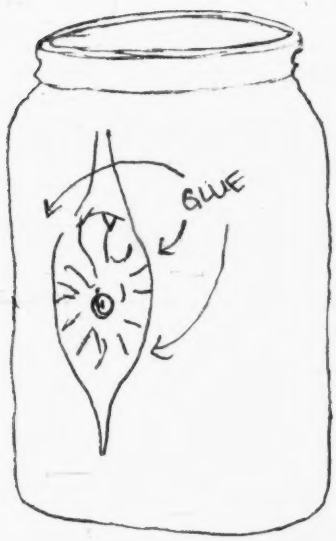
Look in almost any vacant lot, field, weedy ditch or border area.

Have a number of glass jars available to hold the galls.

What to Do with a Gall Collection

A collection of galls can be experimented within a number of different ways. Here are some. You may think of others. Here are three preparations to make for experimenting with gall-wasps.

Preparation I: Carefully cut some galls open with a razor blade or sharp knife. Make the cut parallel to the stem, but off-center.



The larva should not be distrubed, as it lies in the center of the cavity.

Trim the cut so the larva is clearly visible. Plac e glue around the cuts and fasten edges to the inside face of a glass jar. This forms a window through which the larva can be viewed.

Cover the jar with a piece of nylon stocking. This allows air to enter. Label jars.

Preparation II: Cut the galls, as described in the first preparation.

Remove the larva from the opened galls and place larva in a glass jar covered with a nylon stocking. Label jars.

Preparation III: Leave some of the galls unopened. Put them in a glass jar with a nylon stocking cover. Label jars.

When Environment Changes--What Then?

Light, moisture, temperature, air movement--these are some of the things that make up environment. What happens to living things when these change?

Will the larva in the golden rod galls be affected?

Depending on the number of galls you've collected, make some or all of the following tests. Maybe you can think up others.

Test I: Does the amount of light affect the development of the larva?

Fasten dark paper around containers of galls from Preparation I, Preparation II and Preparation III.

Leave an equal number of galls in the light.

Test II: Does the amount of moisture affect the development of the larva?

Keep dampened sponges in one set of containers. Moisten the sponge every day.

Run this test on containers of galls from Preparation I, Preparation II and Preparation III.

Test III: Does temperature affect development of the larva?

Take several thermometers and find spots in the room which stay at different temperatures (like a window or air vent).

Check these temperatures each day, for several days, to make sure they are nearly the same (a variation of 5 degrees is permissible).

When several spots have been found, place containers of galls from each of the three preparations in these places.

Don't forget to check the containers daily. Keep a daily temperature record. Record what's going on in each container every time you check. Include date and preparation number of the container, too. Use record sheets like this sample.

SAMPLE RECORD SHEET
FOR
Golden Rod Gall Experiments
PREPARATION I

Date Temp	Observations TEST I	Date temp	Observations TEST II	Date Temp	Observations TEST III

Notes to the Leader:

Try to maintain as much suspense as possible during this investigation.

It is not necessary to tell the children what they will find when they cut their galls open.

The fact that this little worm-like creature is called a "larva" is not even too important.

And, it certainly is not necessary for them to memorize that the larva becomes a pupa, which becomes an adult wasp. They will see this happen.

About two to three weeks after bringing galls in, wasps will begin to emerge. If the children do not know that a wasp will make his appearance, they will be much more excited when he does.

The more galls the better as not every gall successfully produces a wasp.

These wasps do not sting or bite.

Other Surprises:

The children will make other discoveries...usually without urging. For example:

The larva eats out an "escape tunnel" for the wasp before the larva becomes a pupae.

The pupae is hard and oval, and does not move.

The wasp has folded, crinkled wings immediately after emerging.

After emerging, the wasp sits on the gall until the wings straighten out and the balloon on his head collapses.

SOIL IS ALIVE--AND HUNGRY

Dig Down to Where the Action Is!

Do you ever wonder what happens to the leaves, bugs, berries and small animals that die and fall on the ground?

Does something eat them? Do they simply rot away?

Actually, there's a whole, very-much-alive world of life in soil. Plant and animal remains that lie on, or in, the dirt are chewed up and decomposed by various organisms.

Some organisms prefer certain types of materials over others.

Take leaves, for example. It's fun and easy to dig down and find out which hungry soil organisms prefer leaves... and what leaves they like best.

To Find Out What Diet's Preferred You'll Need (For a Group Project)

1. Several large plastic or glass containers with covers. These should be about 9x12x4 inches. Plastic shoe boxes work well.
2. Magnifying glasses or hand lenses.
3. Trowels or digging tools.
4. Dissecting microscope, if possible.
5. Tree identification book.
6. Pencils and paper.
7. One large piece of paper for a map.
8. Six or eight individuals or teams of students.

Where to Collect Soil:

Each individual or team needs a large plastic box with cover, digging tool, paper and pencil.

Take this equipment to the chosen spot...a woods, meadow or some other relatively undistrubed place.

Carefully dig up some of the top layer of soil. Put enough in the plastic box to cover the bottom with one inch of soil.

Remove all growing plants and dead leaves from the soil in your box.

All teams should get soil from the same general area.

The most "alive" soil is found where many has disturbed it least. There are many more soil organisms in a meadow, for example, than in a field that is plowed each year. Sandy soil has fewer organisms if there is no ground cover.

Next, Draw a Map.

Draw a large group map of the area where samples were collected. Mark the location of each sample.

It is important to know if the soil is from a forest or field; from under a tree or out in the open; from a low marsh or a high hill. Location will make a difference in the kinds of soil organisms and what they eat.

Describe the Spot.

On a sheet of paper, describe the plants or trees growing in each soil sample location.

Is it an open field with mostly grass growing in it? Or, is it a brush area with bushes and small trees? Are there tall trees, or is it a marsh? Is the ground covered with vegetation or dead leaves?

Describe the Soil.

Pick up some soil and work it with your fingers. Describe the moisture content of your soil sample.

Dry soil is crumbly, feels dry, falls apart easily when you handle it.

Moist soil feels damp to the touch, or maybe spongy.

Wet soil drips water when you pick it up or squeeze it.

Describe the texture of your soil sample.

Sandy soil is made up of grains of sand.

Clay-ey soil sticks together in clumps; has lots of clay in it.

Loamy soil is made up mostly of dead leaves and other organic matter.

The Data Sheet for team work may be copied and used as a handout to help teams describe their soil.

To Start Action in a Soil Box:

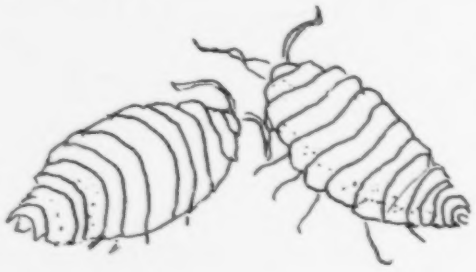
Look for sowbugs and leaves. This activity may be included in the soil collecting field trip, or it may be done at a later time.

If it is done later, soil boxes may be left on the shelf, and materials collected in large plastic bags.

Each student or team should collect materials for his or their own box.

Where Do Sowbugs Live?

Look in cool, dark, moist places for sowbugs or pillbugs. Check under logs, stones, boards, leaves and other like places to find these little isopods. They look like this:



Capture about 10 of these bugs with your hand. They don't bite. Put them in the soil box or a plastic bag.

You'll Need Leaves, Too.

Find three or four dead leaves from different kinds of trees. Try to find leaves that haven't been chewed or broken.

Dead leaves may be picked up under the tree.

Live leaves, picked off a branch, may be killed by submerging them in boiling water for a minute or two.

What Kinds of Leaves?

Leaves should be chosen from the following table, if possible. You may need a tree identification book to find the various types. Choose only one leaf from any group.

Group I	Group II	Group III	Group IV	Group V
1. Black elder	1. Alder	1. Spruce	1. Basswood	1. Oak
2. Hornbeam	2. Ash	2. Beech	2. Maple	2. Birch
	3. Elm	3. Red oak		3. Aspen
		4. Pine		
		5. Douglas fir		
		6. Larch		

Put the three leaves in your soil box, lying flat on top of the soil. Put in the sowbugs, too, if you haven't already done so.

When everything is inside, put the cover on and place the box in an easily accessible place--away from heat and sunlight. If the top is kept on, the box should stay moist enough for the soil organisms. If the soil starts to dry out, sprinkle it very lightly with water. Check the box every day.

Watch the Box and Record Activity

Watch your team's box carefully. Do you see any signs of life besides the sowbugs? There may be some worms, insects or spiders. Look at them with magnifying glasses or the microscope.

Inspect the dead leaves in your box very carefully each day. Have any of them been chewed on? Which of the three or four types of leaves appear to be the most attractive to the soil organisms? Record your findings on a team data sheet.

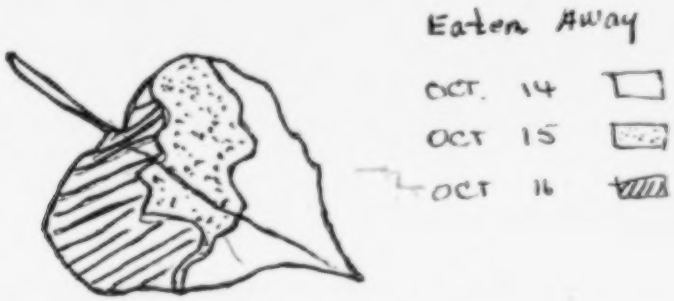
After several days, compare your observations with those of other teams to see if you can work out a list of which leaves get chewed up and decomposed first. Use a group data sheet.

For example, if every team which had a maple leaf or a linden leaf in its box found that this leaf was chewed on the first day, before any other kind of leaf was touched, these leaves would be the most attractive to the soil organisms. If elm leaves are chewed next, these would be second in order of preference.

You may be able to tell which organisms are eating the leaves by actually catching them in the act, or by finding their droppings. Sowbug droppings are small, brown and sort of rectangular.

The leaves that are being decomposed in the soil box may be chewed in different patterns. Some leaves may be eaten out between the veins, some may be chewed full of holes, and some may be simply devoured from one edge to another. Are the eating patterns different on your three leaves?

Draw a picture or "map" of each of your leaves. Indicate in different colored crayon or chalk how much is eaten each day. You may also want to take pictures of your leaves each day.

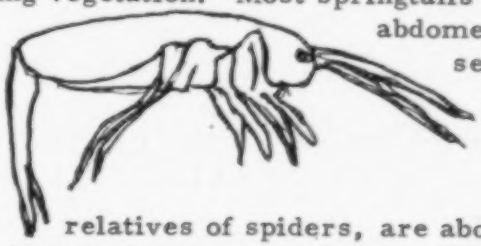


Other Creatures Decompose Leaves, Too.

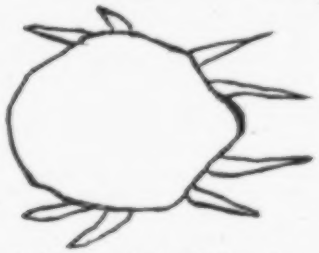
Several other creatures, besides the sowbug, help decompose leaves.

Earthworms ingest (eat) particles of leaf and mix them with soil in their bodies. Their droppings, called earthworm "castings," help to enrich the soil, and their burrowing helps to aerate (let air into) it.

Springtails are small insects which occur in large numbers in soil. Most of them eat decaying vegetation. Most springtails have spring-like contraptions on their abdomens that enable them to catapult several inches into the air when disturbed.



Small mites, relatives of spiders, are about the size of a pin prick and usually occur in even larger numbers in soil than springtails. Most of these are predatory, living on springtails and other small soil animals.



There may be 1,000 springtails and 2,000 mites in 3 cubic inches of natural forest or meadow soil. Springtails and mites will probably be the animals you will most often notice on the leaves in your soil box.

If the soil is moist or wet, there may also be some slugs and snails.

If it is too moist, mold will grow.

DATA SHEET FOR SOIL IS ALIVE

NAME _____

Describe location where soil was collected:

Describe soil:

Moisture Content -- Choose one

1. **DRY - crumbly, feels dry, falls apart easily when handled**
2. **MOIST - feels damp to the touch, or maybe spongy**
3. **WET - drips water when picked up or squeezed**

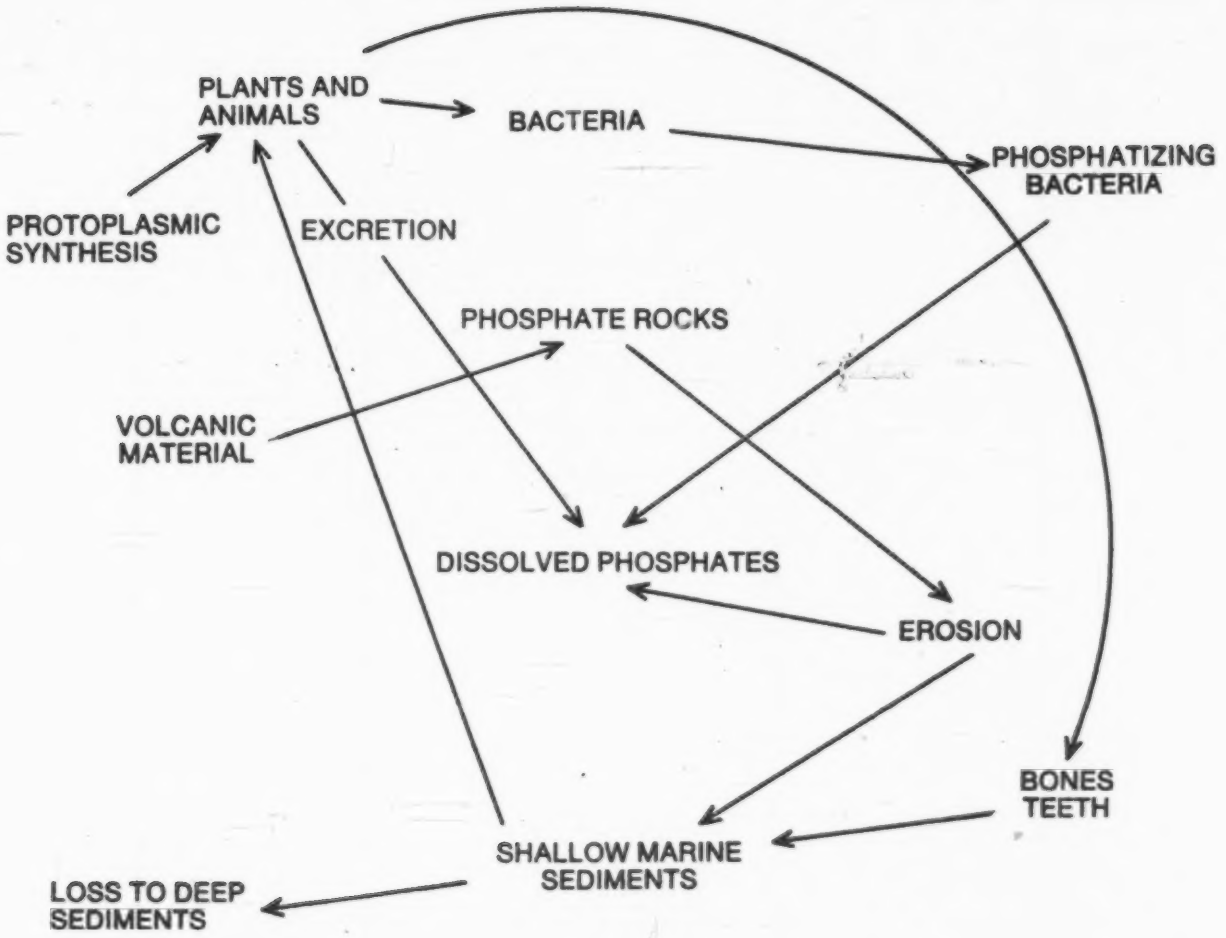
Soil Texture -- Choose one

1. **SANDY - made up of grains of sand**
2. **CLAYEY - sticks together in clumps, has lots of clay in it**
3. **LOAMY - made up mostly of dead leaves and other organic matter**

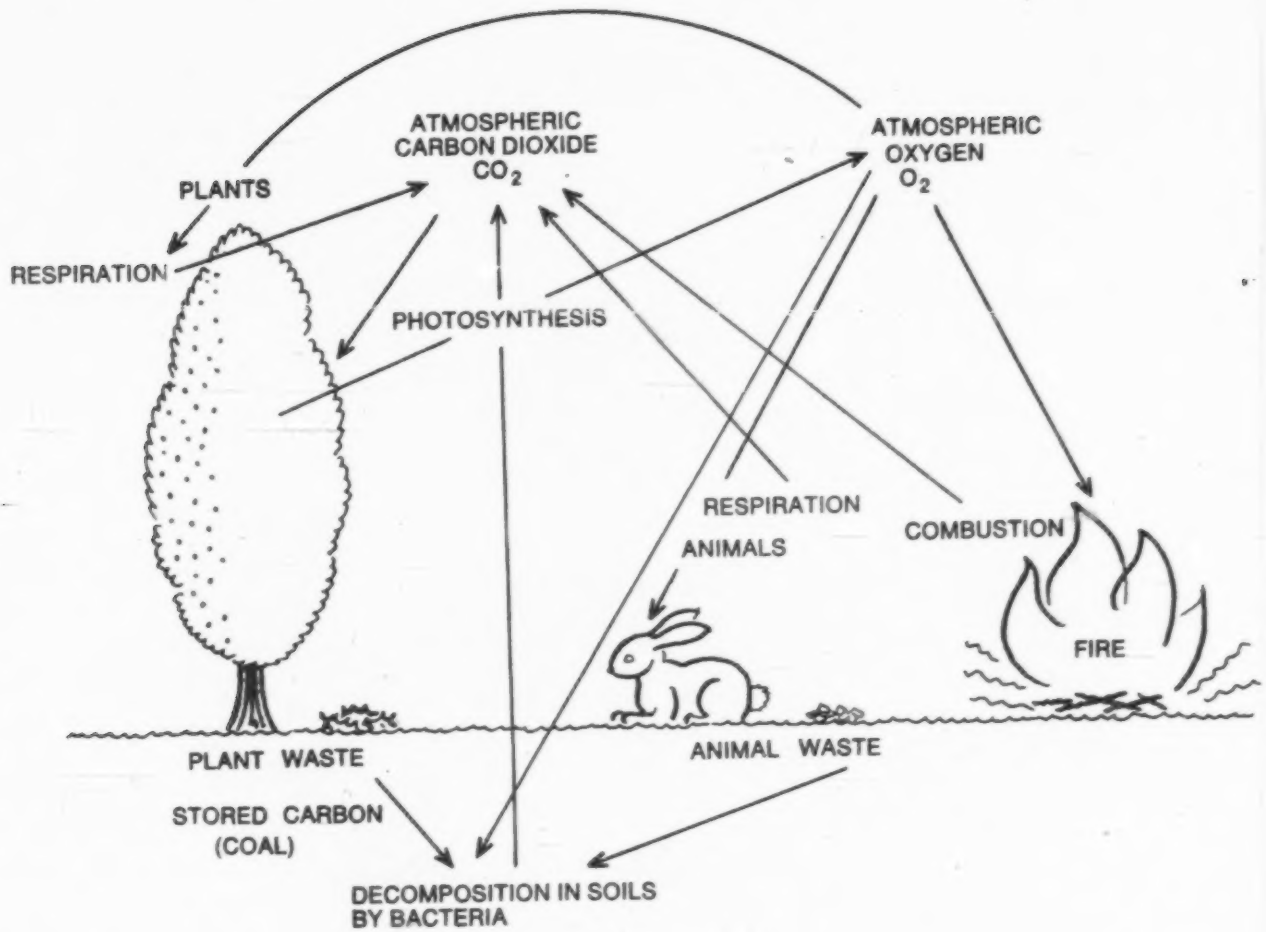
Type of Leaf	Date First Chewed Upon	Date Finished
1.		
2.		
3.		
4.		

GROUP DATA SHEET FOR
SOIL IS ALIVE

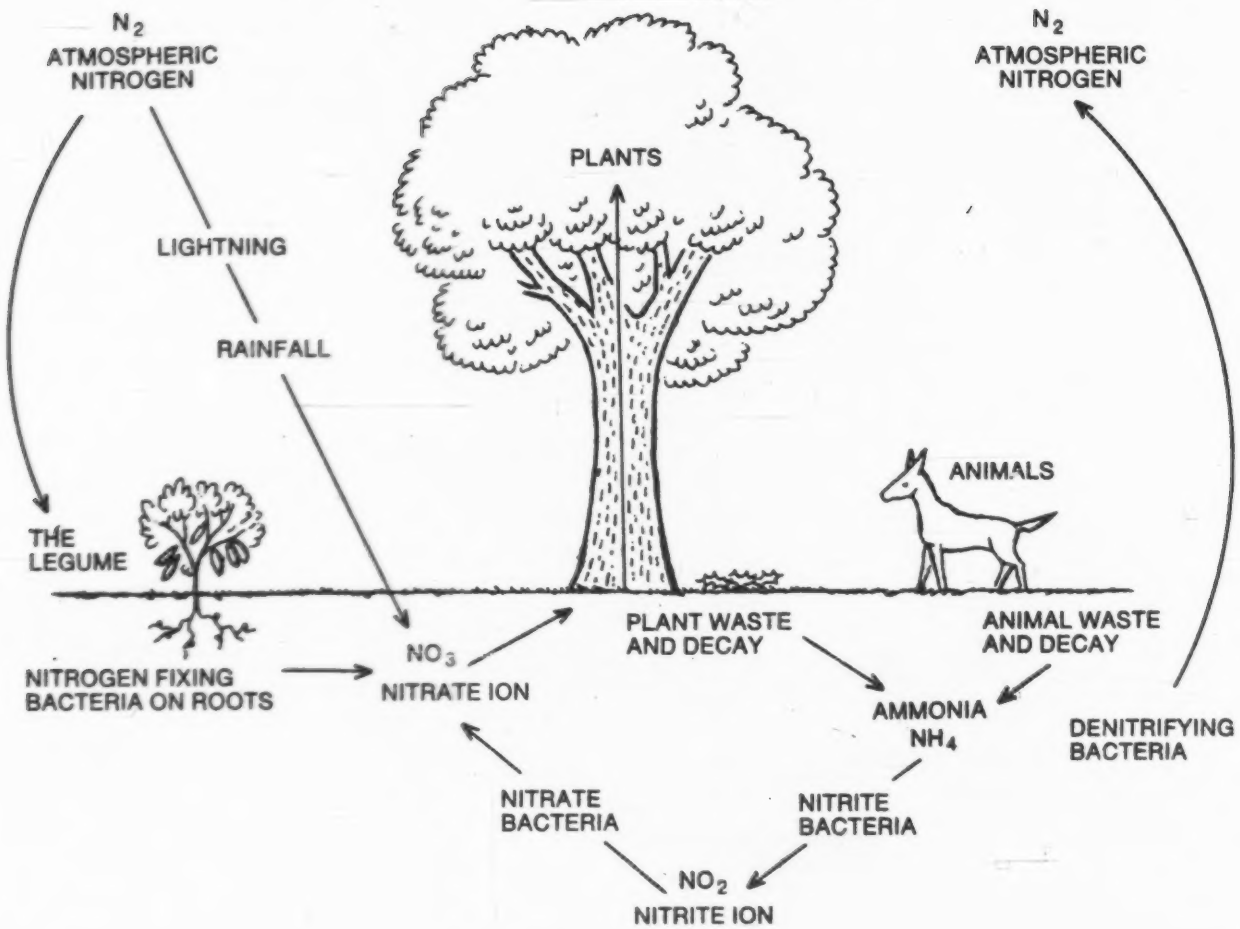
Group	Type of Leaf	Date First Chewed Upon	Date Finished	Comments



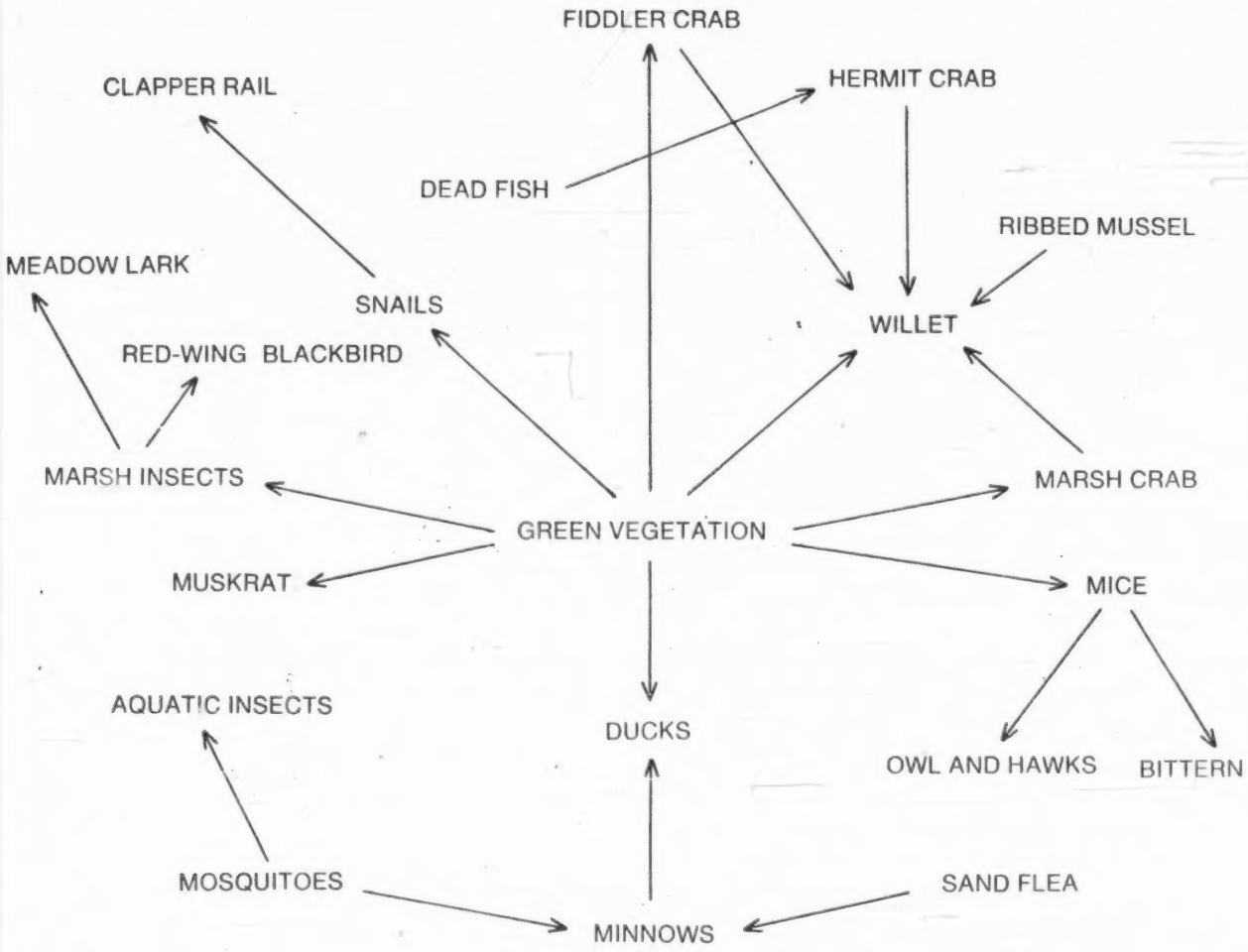
SAMPLE DIAGRAM OF THE PHOSPHATE CYCLE



SAMPLE DIAGRAM OF THE CARBON-OXYGEN CYCLE



SAMPLE DIAGRAM OF THE NITROGEN CYCLE



SAMPLE DIAGRAM OF A FOOD WEB IN A MARSH COMMUNITY

JOHN'S ECOLOGY DRIVE:

A BRIGHT IDEA

How would you like to trade that stack of old newspapers for a brand new light bulb? Ecology-conscious citizens in Syosset, N. Y., are getting that option, thanks to 16-year old John Desmond, an energetic teen who has started a thriving recycling business.

His mammoth paper drive is called "Save the Planet" and is advertised via mimeographed flyers. The reward for every two-foot high stack of newspapers is a free light bulb.

"I figured that if you give people something in return for what they give you, the response will be greater," says John.

He figured right. Seven thousand pounds of newspapers later, the business is making a nice profit for John as well as cleaning up the community. John gets 40¢ for each two-foot stack of papers he sells to recycling companies. His operating expenses: nine cents for a light bulb and ten cents for transportation. His profit: 21 cents per two-foot stack.

The teen businessman is also adding profits from a weekend ice cream stand job and freelance lawn mowing to his college fund.

What are his ultimate ambitions? "My Mother would like to see me become a doctor," says John. "But I'm more inclined toward business."

This is one young tycoon who's off to a good start!

EUTROPHICATION

A SIMPLE CLASSROOM EXPERIMENT

Eutrophication is a pollution problem. It results in the death of fish, frogs, salamanders, crayfish, insects, and other aerobic forms of aquatic life. They die because of deficiency of dissolved oxygen in water. The oxygen deficit is caused primarily by bacterial decomposition of unusually large amounts of algae. This overgrowth of algae occurs because excessive amounts of plant nutrients. Two of these nutrients, nitrogen and phosphorus, which stimulate algae growth, may originally have been constituents of agricultural fertilizers. They leached out of the soil and were then washed into ponds and lakes.

When sewage, garbage, and other biodegradable organic wastes get into ponds and lakes, they decompose there. When that happens, they release plant nutrients which stimulate algal growth. When the algae die, they are in turn decomposed by bacteria. Often there is so much algal material that the bacteria consume all the dissolved oxygen. Then there is none left for fish, frogs, insects, and other animal forms which cannot live without an adequate oxygen supply. When that happens, these animals die. They literally suffocate.

It is easy to set up a simple classroom experiment to demonstrate the oxygen depletion stage of eutrophication. You can then see it slowly happening before your eyes.

To do that, you need two clear, colorless glass quart or gallon jars of the same size and shape. Fill them both with water to about an inch from the top. Then add the same number of drops of a methylene blue solution to the water in each jar, while you stir it. You can buy a small bottle of methylene blue solution in a pet store. This compound has antiseptic properties, and is added to aquarium water to treat fish infections. Add enough methylene blue so that the water is moderately light blue. The color should be the same in both jars.

Then cut up three apple cores or approximately the same amount of orange skins, carrot tops, banana peels, or any other plant material with two tablespoonfuls of soil. Wrap everything in a piece of cotton cloth the size of a large handkerchief. Tie it tightly with string to a stone. Then let it sink to the bottom of one of the jars. Cover both jars with a plate or aluminum foil.

The jar with colored water alone is the control. In the other jar, the soil corresponds to the mud on the bottom of ponds and lakes. The plant material you cut up corresponds to dead algal tissue. When bacteria decompose the pieces of apple core or whatever else you used, they consume the oxygen that is dissolved in the water. You can tell this happens because within a few days, the solution becomes colorless.

Methylene blue is blue only in the presence of oxygen. When oxygen is used up by bacteria, methylene blue loses its color. The solution then becomes colorless. You can therefore tell when and where dissolved oxygen is disappearing by the loss of color. The methylene blue in the control jar, in which bacteria are not decomposing plant material, does not decolorize.

Fish and other aerobic animals can live in water in which methylene blue exhibits its distinctive color. When methylene blue becomes colorless, there is not enough oxygen present for them to survive. The jar in which you see decolorization of methylene blue corresponds to a miniature pond or lake where eutrophication has occured. What happens in your jar happens on a much larger scale in nature.

by Prof. A. Schatz, Temple University

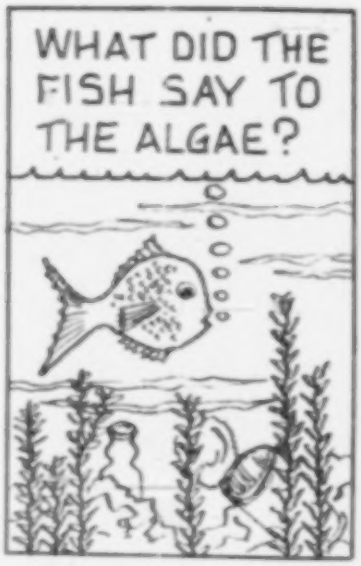
Environmental Action Bulletin
October 30, 1972

IT'S JUST TOO MUCH!

Here is a puzzle you can solve using words related to our environment.

1. Unscramble these five words. The hints beside each scrambled word will help you.
2. Write each unscrambled word in the boxes beside it. Put one letter in each box.
3. Unscramble the circled letters to find the answer to the picture riddle.

Nonmetallic element	**BACORN**	○ ○
Related to heat	**MARLHET**	○ ○ ○
Area of living things	**POIREHEBS**	○ ○ ○
Heavy hydrogen	**MUTEIDUER**	○ ○ ○
We worry about this	**TULIPOLON**	○ ○ ○



"This pond is too rich in dissolved nutrients! That's _____"

Puzzle taken from *Earth Science: A Learning Strategy for the Laboratory.* For further information, see description below.

NOTE: Answers to this puzzle and a detailed list of references for your study of WATER (Books, Pamphlets, Articles, Audio-Visual Aids) may be obtained by using the enclosed prepaid postcard or by writing directly to:

Charles E. Merrill Publishing Co.
A Division of Bell & Howell Company
1300 Alum Creek Drive/Columbus, Ohio 43216

Answers

IT'S JUST TOO MUCH!

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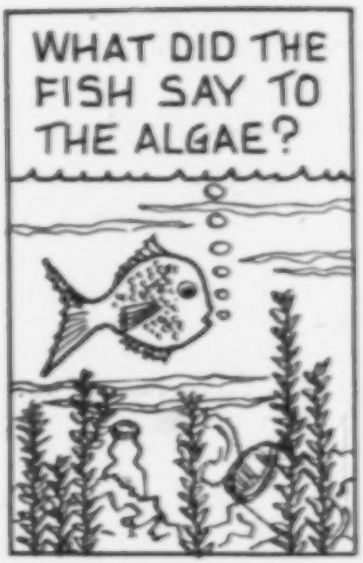
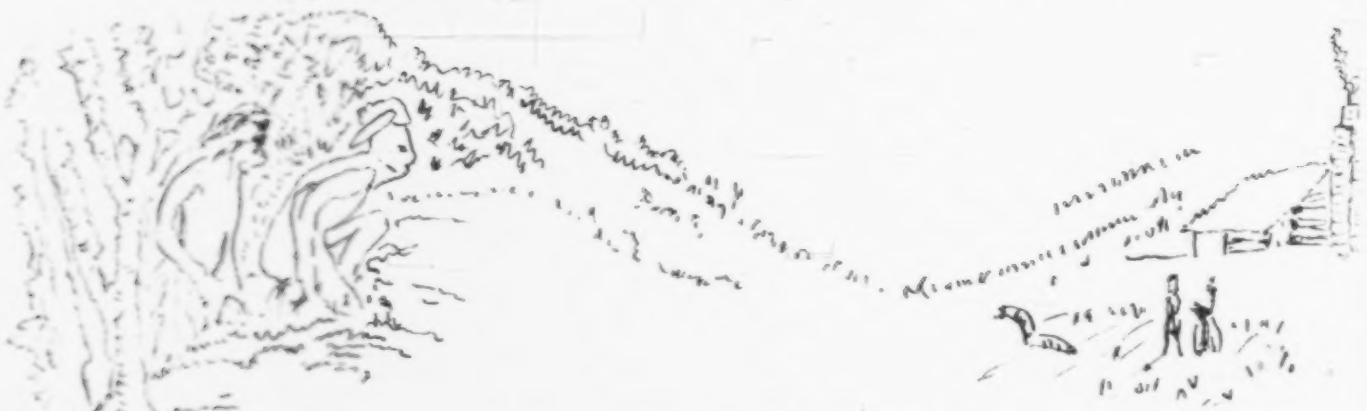
Nonmetallic element	BACORN	(C) A (R) B O (N)
Related to heat	MARLHET	T (H) (E) R M (A) L
Area of living things	POIREHEBS	B (I) (O) S (P) H E R E
Heavy hydrogen	MUTEIDUER	D E (U) (T) E R (I) U M
We worry about this	TULIPOLON	P (O) L L U (T) I O (N)



"This pond is too rich in dissolved nutrients! That's E U T R O P H I C A T I O N"

Puzzle taken from *Earth Science: A Learning Strategy for the Laboratory.*



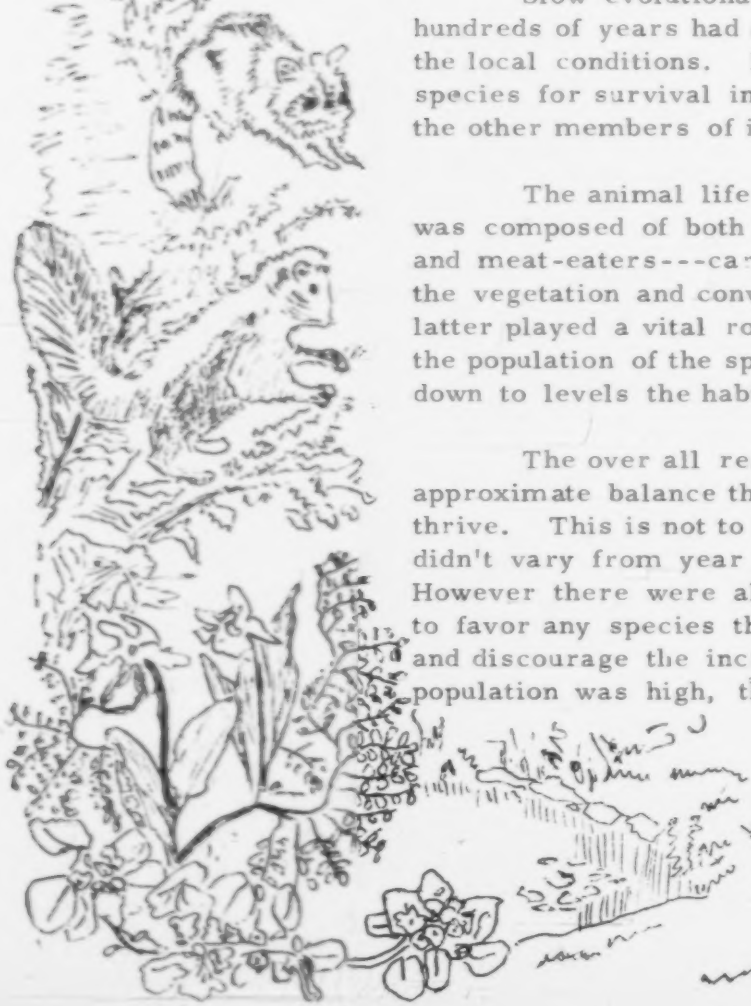
Our Wildlife Heritage

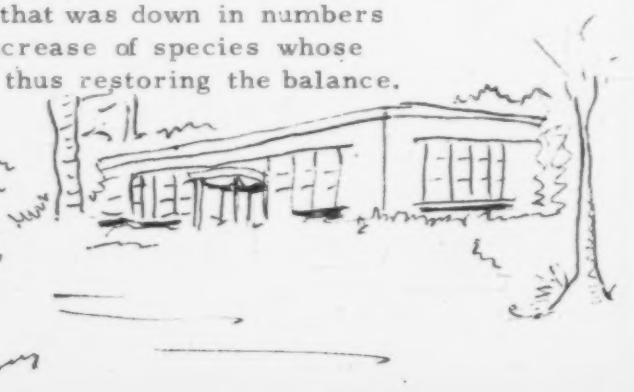
North America is a continent of varied climates and soils, and when the white settlers came they found each region occupied by a distinctive community of plants and animals. There were forests of many types and a variety of grasslands, desert vegetation and in the North, tundra.

Slow evolutionary development over hundreds of years had adapted each species to the local conditions. It had also adapted each species for survival in close association with the other members of its community.

The animal life of these communities was composed of both plant-eaters---herbivores--- and meat-eaters---carnivores. The first cropped the vegetation and converted it into meat. The latter played a vital role as predators in holding the population of the species they preyed upon down to levels the habitat could support.

The over all result was a condition of approximate balance that permitted all to thrive. This is not to imply that populations didn't vary from year to year because they did. However there were always factors that tended to favor any species that was down in numbers and discourage the increase of species whose population was high, thus restoring the balance.





The American Indian lived largely through hunting and fishing, but his crude weapons limited his ability to kill animals. In general, his role was that of a minor predator and he did little to upset the "balance of nature." The Indians' habit of setting fire to the countryside in the dry season more profoundly influenced the world of nature than anything else he did. As a result of these fires, the early settlers found much of North America occupied by plant-animal communities adapted to fire and marked changes are taking place in the vegetation of most regions now that fires have been largely eliminated.

European settlers brought a new way of life to America. They removed the native wild plant-animal communities from the land and substituted cultivated plants, and domestic animals to convert them into meat. First, much of the eastern forest was replaced by crop fields and then tall grass prairies of the middle west. The next step was the elimination of the buffalo from the short grass plains and the substitution of cattle. Needing ever more wood, the white man began to exploit woodlands for pulp wood and timber, completely altering their character in the process. Dense stands of "second growth" trees all of about the same size replaced forests in which trees of all ages from giant veterans to seedlings grew side by side. Soon marshes and swamps began to be drained to provide more crop land and deserts irrigated. Cattle and sheep were moved into the more open dry western forests and into the alpine flower gardens above timberline.

These developments eliminated or profoundly altered a large part of the habitat of most species of wild plants and animals. Only in wild parks, wildlife refuges and wilderness areas have wildlife communities survived in anything resembling their original state. Even here, some of the larger predators are often missing, and elsewhere only the smaller, more adaptable birds and animals have survived.

Much of our wildlife today lives on land occupied by vegetation planted by man-orchards, pastures, croplands and suburban gardens. Most of the rest lives on land on which the native plant-animal community has been greatly altered by man's activities in harvesting products from it - cut off forest land, grazed grasslands and fished waters.

The wide variety of natural habitats that existed in North America led to the evolution of a versatile stock of wild life. As settlers began to alter the landscape with their agriculture and other activities, many native species found the new or altered plant communities very much to their liking. The result was more a substitution of one kind of wildlife for another than any elimination of wildlife.

Animals like bison, elk and rabbits that competed with cattle and sheep for vegetation had to go. Wolves, panthers and grizzly bears that ate livestock also went. On the other hand, insect eating birds like meadowlarks and bluebirds, and mammals like the skunk enjoyed expanded habitats and were welcome. Mouse eating foxes, hawks and owls throve, and birds that could live on weed seeds and waste grain increased.

Where the domestic or managed plant community that was substituted for the original wild one was well adapted to the land, the land continued to be as productive as ever. Even though much of its production was removed for human use, enough remained to support considerable wild life. So long as the minerals removed in the crops and the humus that decayed was replaced, the land remained productive.

Unfortunatedly, some men are greedy and others foolish, frequently, crops not adapted to the land are planted, such as corn on steep slopes. Cattle and sheep are allowed to eat so much that the grass plants die. Excessive cutting and burning of forests degrades them into bushes or limby trees worthless for lumber. Failure to replace minerals and humus impoverishes soils, and the land's vegetation degenerates.

The penalty for such folly is slopes denuded of soil by erosion, streams choked with silt, and lakes so muddy that sunlight cannot penetrate the water to produce food for fish. Floods alternate with droughts, as rain water runs off leaving no reserves stored in the ground to carry plants through dry spells. Inevitably, the yield of useful products from the land declines and so does its wildlife.

Until recently, man had to tolerate a good deal of wild plant and animal life on land devoted to crops. A considerable number of insects were usually present and they served as food for birds. Weeds produced seeds that supported a winter population of sparrows and game birds. Today, insecticides are virtually eliminating all food for insectivorous birds from croplands and sometimes from woodlands as well. Herbicides are controlling weeds and being used to convert field borders and roadsides to grass devoid of wildflowers and shrubs. The poison 1080 has been used with such devastating effect on coyotes and other rodent-eaters recently that their control now necessitates the widespread use of poison grain to which birds also fall a frequent victim.

No longer can we say that all man has done is to substitute a wild life community based on cultivated plants for the original wild ones. Today, intensively managed land is being so sterilized with poisonous chemicals that little or no wild life can inhabit it. Whether the crops it produces will continue to be healthy food for human beings is open to question.

We should feel very grateful to those who had the wisdom and foresight to establish our great system of National Parks, and we should be doing all we can to permanently safeguard for coming generations the wilderness areas in our National Forests. Our state and local parks and refuges are also very important, as it is in them that examples of the characteristic plants and animals of each local region can be given protection. In them the local forest trees can again grow to maturity, wildflowers thrive and birds and mammals re-establish balanced communities. In some of them, extirpated species like the wild turkey can be re-introduced.

Every year, parks and other reserved wild lands receive heavier use by those who enjoy the out-of-doors. It is, therefore, becoming increasingly important that wildflowers be left unpicked for others to enjoy, picnic papers carried home where they can be properly disposed of and animal life enjoyed but not molested.

As our population continues to grow and our cities spread out, we should be setting aside more parks, wildlife refuges and nature preserves every year. When new school sites are purchased, a few acres of land should be obtained for a natural area that can serve as an outdoor classroom and biological laboratory. Many Audubon Junior Clubs, Scout groups and community civic organizations are playing an improtant part in this effort to save a few more natural areas while suitable land is still available. You, too, can help.

Richard H. Pough
President
Natural Area Council

THE GARDEN CLUB OF AMERICA CONSERVATION COMMITTEE
598 MADISON AVENUE, NEW YORK, N.Y. 10022

BAREFOOT DAYS

In the morning, very early,
That's the time I love to go
Barefoot where the fern grows curly
And grass is cool between each toe,
On a summer morning - O !
On a summer morning !

That is when the birds go by
Up the sunny slopes of air,
And each rose has a butterfly
Or a golden bee to wear;
And I am glad in every toe -
Such a summer morning - O !
Such a summer morning!

Rachel Davis

QUEEN ANNE'S LACE

Queen Anne, Queen Anne, has washed her lace
(She chose a summer day)
And hung it in a grassy place
To whiten, if it may.

Queen Anne, Queen Anne, has left it there,
And slept the dewy night;
Then waked, to find the sunshine fair,
And all the meadows white.

Queen Anne, Queen Anne, is dead and gone
(She died a summer's day),
But left her lace to whiten on
Each weed-entangled way!

Mary Leslie Newton

THE TREES

The poplar is a French tree,
A tall and laughing wench tree,
A slender tree, a tender tree,
That whispers to the rain---
An easy, breezy flapper tree,
A lithe and blithe and dapper tree,
A girl of trees, a pearl of trees,
Beside the shallow Aisne.

The oak is a British tree,
And not at all a skittish tree;
A rough tree, a tough tree,
A knotty tree to bruise;
A drives-his-roots-in-deep tree,
A tree of stubborn thews.

The pine tree is our own tree,
A grown tree, a cone tree,
The tree to face a bitter wind,
The tree for mast and spar---
A mounting tree, a fine tree,
A fragrant turpentine tree,
A limber tree, a timber tree,
And resinous with tar!

Christopher Morley

FIREFLY

A little light is going by,
Is going up to see the sky,
A little light with wings.

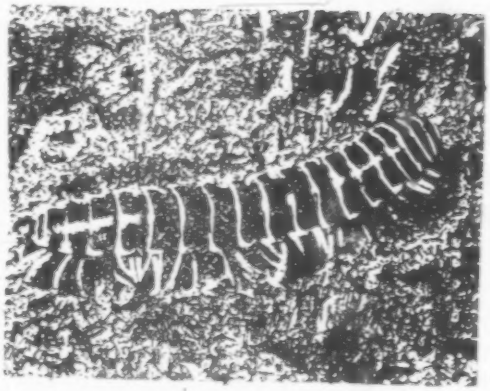
I never could have thought of it,
To have a little bug all lit
And made to go on wings.

Elizabeth Madox Roberts

A CENTIPEDE WAS HAPPY QUITE

A centipede was happy quite
Until a frog in fun
Said, "Pray, which leg comes after which?"
This raised her mind to such a pitch
She lay distracted in the ditch
Considering how to run.

Anonymous



THE DANDELIONS

Upon a showery night and still
Without a sound of warning,
A trooper band surprised the hill,
And held it in the morning.

We were not waked by bugle-notes,
No cheer our dreams invaded,
And yet, at dawn, their yellow coats
On the green slopes paraded.

We careless folk the deed forgot;
Till one day, idly walking,
We marked upon the self-same spot
A crowd of veterans talking.

They shook their trembling heads and gray
With pride and noiseless laughter;
When, well-a-day! they blew away,
And ne'er were heard of after!

Helen Gray Cone

THE TREE TOAD

The tree toad is a creature neat,
With tidy rubbers on his feet,
Embarrassment is all he knows,
His color comes, his color goes.

Monica Shannon

THE SNAIL

The snail is very odd and slow,
He has his mind made up to go
The longest way to anywhere
And will not let you steer him there.

Today I met one in the grass
And hadn't time to watch him pass,
But coming back at sunset, I
Discovered him still traveling by.

The grass-blades grew so thick and tall
I asked him why he climbed them all,
And told him I had sometimes found
The shortest way was going 'round.

He was not easy to persuade,
To judge by any sign he made,
And when I lectured him some more
Went in his house and shut the door.

Grace Hazard Conkling

SEA SHELL

Sea Shell, Sea Shell
  Sing me a song, O please!
A song of ships, and sailor men,
  And parrots, and tropical trees,

Of islands lost in the Spanish Main
Which no man ever may find again,
Of fishes and corals under the waves,
And sea-horses stabled in great green caves.

Sea Shell, Sea Shell,
Sing of things you know so well.

Amy Lowell

CHIPMUNK

Furry, striped friend with mumps
Who caches berries under stumps
How do yor fare beneath the snow
When wintry blasts begin to blow?
I watched your summer's scurried reaping
Of seeds and nuts and for your sleeping,
Mouthfuls of leafy bits and bark
To keep you snug in frigid dark.
They say you doze 'til winter's past,
That though you heard enough to last
For several seasons underground,
There's plenty left when spring rolls 'round.
Why, then, insist on frenzied forage
When half as much is ample storage?

Verne N. Rockcastle

THE DRAGON-FLY

"Today I saw the dragon-fly
Come from the wells where he did lie.

"An inner impulse rent the veil
Of his old husk: from head to tail
Came out clear plates of sapphire mail.

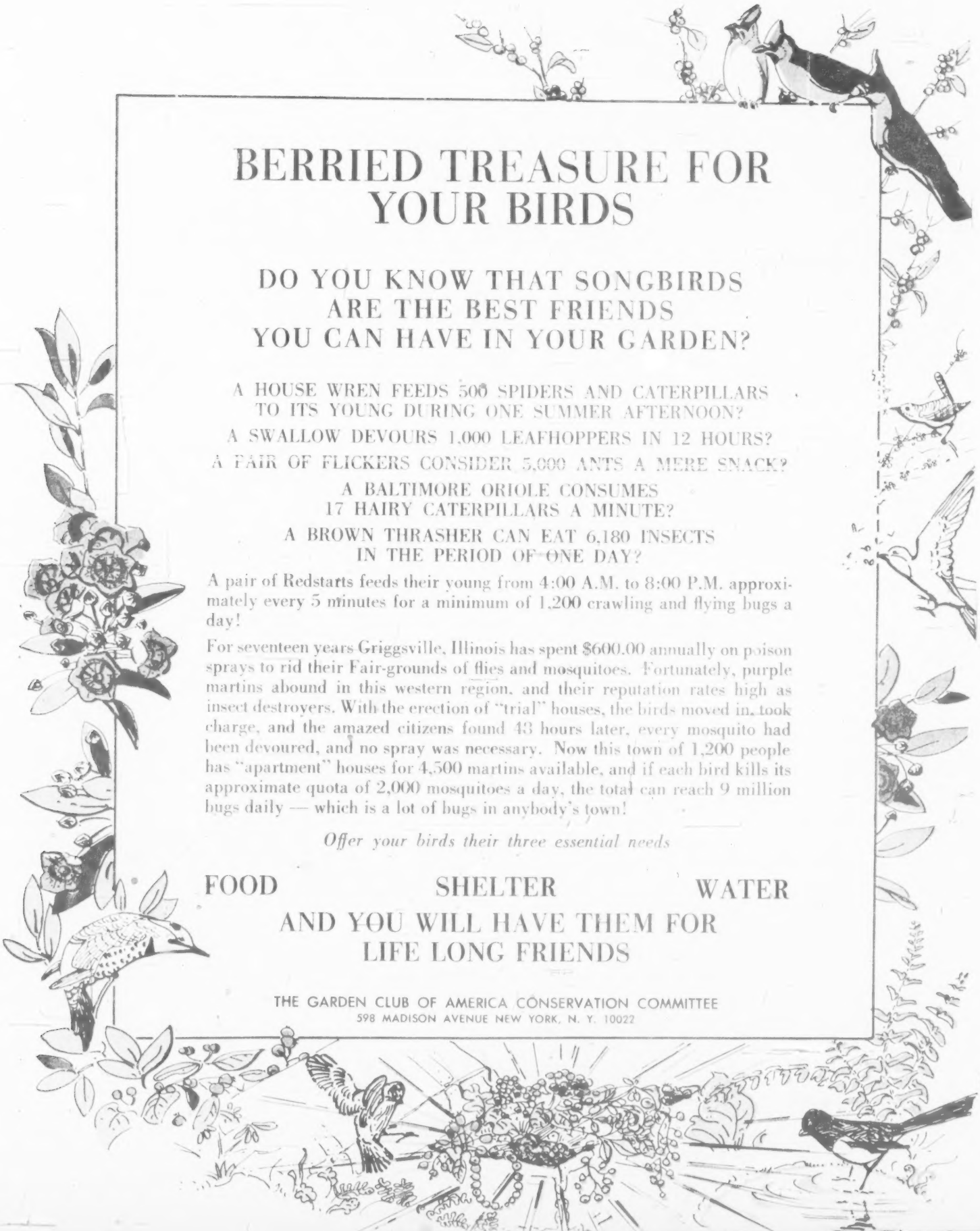
"He dried his wings: like gauze they grew;
Thro' crofts and pastures wet with dew
A living flash of light he flew."

Alfred Tennyson

SPLINTER

The voice of the last cricket
across the first frost
is one kind of good-by.
It is so thin a splinter of singing.

Carl Sandburg



BERRIED TREASURE FOR YOUR BIRDS

DO YOU KNOW THAT SONGBIRDS ARE THE BEST FRIENDS YOU CAN HAVE IN YOUR GARDEN?

A HOUSE WREN FEEDS 500 SPIDERS AND CATERPILLARS TO ITS YOUNG DURING ONE SUMMER AFTERNOON?

A SWALLOW DEVOURS 1,000 LEAFHOPPERS IN 12 HOURS?

A PAIR OF FLICKERS CONSIDER 5,000 ANTS A MERE SNACK?

A BALTIMORE ORIOLE CONSUMES 17 HAIRY CATERPILLARS A MINUTE?

A BROWN THRASHER CAN EAT 6,180 INSECTS IN THE PERIOD OF ONE DAY?

A pair of Redstarts feeds their young from 4:00 A.M. to 8:00 P.M. approximately every 5 minutes for a minimum of 1,200 crawling and flying bugs a day!

For seventeen years Griggsville, Illinois has spent $600.00 annually on poison sprays to rid their Fair-grounds of flies and mosquitoes. Fortunately, purple martins abound in this western region, and their reputation rates high as insect destroyers. With the erection of "trial" houses, the birds moved in, took charge, and the amazed citizens found 43 hours later, every mosquito had been devoured, and no spray was necessary. Now this town of 1,200 people has "apartment" houses for 4,500 martins available, and if each bird kills its approximate quota of 2,000 mosquitoes a day, the total can reach 9 million bugs daily — which is a lot of bugs in anybody's town!

Offer your birds their three essential needs

FOOD SHELTER WATER

AND YOU WILL HAVE THEM FOR LIFE LONG FRIENDS

THE GARDEN CLUB OF AMERICA CONSERVATION COMMITTEE
598 MADISON AVENUE NEW YORK, N. Y. 10022

PLANT TREASURES FOR A SANCTUARY

BLUEBERRY, HIGHBUSH BLUEBERRY
Vaccinium corymbosum
Flowers: white to pinkish, late May
Fruit: blue black, fall

One of the MOST sought after berries. Among 93 species enjoying this sweet fruit are cardinals, chats, finchs, flycatchers and titmice. Buy recommended variety in your area.

CHERRY, FIRE OR PIN
Prunus pensylvanica
Flowers: white, early May
Fruit: small, red, late August

A splendid fruiting tree for birds, and beautiful in flower. This great favorite of 80 species keeps birds away from cultivated fruit.

CORNELIAN CHERRY
Cornus mas
Flowers: mass of tiny yellow blooms in March
Fruit: scarlet, August

Its attractiveness as an ornamental, food and nesting tree, makes it deserving of more use. Proper pruning can make it into 12′ to 15′ tree. Free from pests.

CRAB APPLE, JAPANESE FLOWERING
Malus floribunda
Flowers: pink to white, early May
Fruit: yellow and red, late August to mid October
Sargent Crab Apple, M. sargenii
Flowers: white, mid May
Fruit: deep red, fall

Hardy, dependable and fine for food and nesting. Small apple like fruits remain for winter birds. For other outstanding varieties try *M. zumi calocarpa* and *M.* Red Jade, with small shining red fruit.

COTONEASTER, EARLY
C. adpressa praecox
Flowers: white, June
Fruit: scarlet, September

Spectacular, low (1′ to 1½′) semi-evergreen, with mass of bite size berries. Also good are Mayflower, *C. multiflora calocarpa*, and *C. horizantalis*, both higher branching, and profuse with berries.

DOGWOOD, WHITE FLOWERING
Cornus florida
Flowers: white, mid May
Fruit: bright red, fall
JAPANESE
C. Kousa
Flowers: white, mid June
Fruit: scarlet, resemble bright strawberries

The loveliest small ornamental native tree in the east. At least 100 birds eagerly feed on these bright berries. Fine for migrating robins, blue birds, thrushes as well as winter birds. Japanese dogwood equally popular.

SHRUB DOGWOOD, SIBERIAN
Cornus alba siberica
Flowers: yellowish white, late May
Fruit: white to blue, July

Ninety species enjoy luscious white fruits of shrubs. *C. racemosa* is thicket forming, with white fruits on red stems. Red-Osier, *C. stolonifera* has brilliant red branches, spreads easily. All make striking winter display and pruning keeps them so. "Coral Beauty" very superior.

FIRETHORN
Pyracantha, coccinea lalandi
Flowers: June
Fruit: orange red, October

Masses of brilliant berries in fall and winter make good emergency food. Heavy evergreen foliage provides necessary cover. Try *P. wateri* compact, hardy, also *P. rogersiana* (dwarf red) both new.

HEMLOCK
Tsuga canadensis
Flowers: May
Fruit: cones all year

Particularly good for nesting and shelter. Seeds in small cones are fine fall and winter food for crossbills, pine siskins, chickadees, and grosbeaks.

HAWTHORN, WASHINGTON
Crataegus phaenopyrum
Flowers: white, mid June
Fruit: bright red

Fine nesting tree. Its clusters of profuse berries are unsurpassed for lasting into winter for finchs, pine grosbeaks, thrashers — 39 species in all.

OLD AND NEW — TRIED AND TRUE

HOLLY, AMERICAN
Ilex opaca
Flowers: inconspicuous white
Fruit: scarlet, all winter

Our best native holly for eastern seaboard and one of most attractive trees to birds. One hundred varieties all desirable. Special favorites producing the finest red berries are St. Mary's, shrubby, and Croonenburg. Both sexes needed for fruit.

HOLLY, JAPANESE
Ilex crenata
Flowers: white
Fruit: black

Seventy-five hardy attractive varieties, small and tall. All liked by countless species of birds. Try *I. pernyi*, *I. convexa*. *I. pendanculosa*, is shrubby, hardy, with spineless leaves, brilliant fruit on drooping stems. Hardiest of deciduous hollies are Winterberry, *I. verticillata* and *I. serrata*, hardy to — 15°.

MAGNOLIA, STAR
M. stellata
Flowers: white, star shaped, March to April
Fruit: red seeded cones, September

Many birds delight in red seeds which emerge from soft green cones hanging on semi-elastic threads. Try *M. soulangeana* (Saucer) and for the south, *M. grandiflora* is spectacular.

MULBERRY, RUSSIAN
Morus alba tatarica
Flowers: April - June
Fruit: white, pinkish to purple

No use as ornamental shrub but is hardy, produces marvellous early summer fruit for all song birds. They bypass cherries for mulberries. Messy — don't plant near walks. *M. pendula* is weeping form. Plant both male and female.

PINE, WHITE
Pinus strobus
Flowers: early spring
Fruit: cones, all year

Pine family THE most important food source for birds. Cone seeds attract 63 species. Two other fine choices are Swiss Stone Pine, *P. cembra*, slow growing, compact, lush green foliage, and Japanese White Pine, *P. parviflora*, slow grower, outstanding.

RED CHOKEBERRY
Aronia arbutifolia
Flowers: late May
Fruit: bright red, fall

Common shrub in eastern woods. Good asset is that fruit is abundant, dependable and has proven a great favorite. Try *A. brilliantissima* — magnificent.

RUSSIAN OLIVE
Elaeagnus angustifolia, and E. umbellata
Flowers: silvery outside, yellow within
Fruit: yellow coated berries, silver scales; early fall

Both species highly recommended and are remarkable for clusters of berries which birds devour; 50 species, including 12 kinds of game birds. Fine for nests and shelter. Both hardy country wide and near sea shore.

SERVICEBERRY OR SHADBUSH
Amelanchier canadensis
Flowers: late April
Fruit: dark red, July

Mid summer fruit especially appealing for fledgling and 43 species enjoy them. Early white blossoms are a delightful display.

VIBURNUM, EUROPEAN CRANBERRY
V. opulus
Flowers: white, late May
Fruit: red to black on red stalks

Scarlet fruits last well into winter. Not eaten until frozen repeatedly. The many varieties of viburnum make this family FIRST choice of deciduous shrubs for birds. *V. maries* double file not as susceptible to aphids, has good branching habit. Try *V. wrighti*, *V. sieboldi*, and *V. opulus compactum* (dwarf).

SKIMMIA, REEVES
S. reevesiana
Flowers: pure white
Fruit: dark crimson red

A low evergreen compact plant 1′ to 1½′. Best of two varieties. Fruit is consistent, is always borne, good for ground feeders.

(For information on various regional plants, send for "Trees and Shrubs for Birds in Your Garden," by Mrs. Avery Rockefeller *(Reprinted from* Bulletin of Garden Club of America, *revised 1965)* to The Garden Club of America, 598 Madison Ave., New York, N. Y. 10022.)

WHAT ABOUT FOOD?

When feeding for first time, try an open shelf. Several feeding stations are better than one. After birds find seeds, use covered one — keeps out rain and snow. Better not to feed at all if not constant.

WHAT ABOUT SQUIRRELS AND CATS?

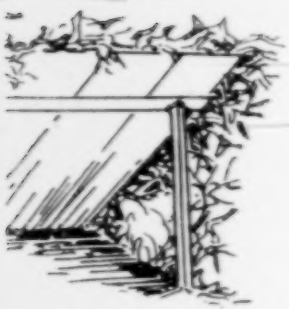
Use poles with "baffles" or "collars." Keep 6 to 8 ft. from trees.

WHAT ABOUT PIGEONS AND STARLINGS?

Restrict to — suet sticks, feeders with small openings, no ground feeding.

SHALL I FEED IN SUMMER?

Yes, if you like lots of birds around — will still eat natural food.



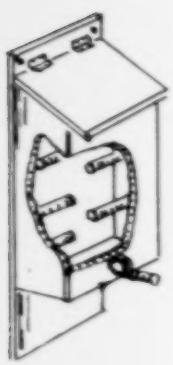
WHAT KINDS OF FOOD DO BIRDS LIKE?

Sunflower and millet for seed eaters. Peanut butter *mixed* with dry cereal, doughnuts, beef suet preferred fat.

Oranges and apples (½) for orioles, catbirds. Dried currants, raisins — catbirds, thrushes, robins. Coarsely ground raw peanuts — cardinals, nuthatches, titmice, pine siskins. Hang an ear of corn in tree for cardinals. *Every bird needs coarse sand or grit in their diet.*

Why not plant small patches of flowers whose seeds will attract songbirds and ground feeders such as finchs, juncos, white throated sparrows, song sparrows, and chickadees? Special favorites: Bachelor-buttons, Coreopsis, Marigolds, Sunflowers, and Butterfly weed.

WHAT ABOUT SHELTER?



For nesting birds: Plant evergreens of pine, spruce, hemlock, cedar, evergreen shrubs, and dense hedges. Boxes for hole nesting birds: Chickadees, bluebirds, flickers, nuthatches, tree swallows, woodpeckers and wrens. Good idea — clean house out before nesting begins. Spray with cresol to kill bird lice, insects, and wasps.

For winter cover, shelter from rain, snow and cold, build a shelter of brush and tree limbs, approximately 5′ wide by 3′ high, in a protected corner. Cross branches irregularly, top with evergreen boughs for roof. Sprinkle seed outside for emergency feeding.

A lean-to shelter is also effective during winter months, if carefully built and cared for. See it does not form a trap for cats to attack birds, also keep food constant. Three sides should be open, roof with brush, corn stalks, evergreen boughs, or discarded Christmas trees.

Winter shelter is often neglected. Old nesting boxes are not satisfactory. Too often bluebirds have been found frozen in them after a cold night of freezing rain or snow. Here is a good design to follow in making waterproof shelter: Stagger perches, make entrance hole at bottom of box to accumulate body heat. Specifications: Floor 8″ x 8″. Back 9½″ x 2½ ft. Front 9½″ x 22″. Sides 8″ x 22″ or 24″. Roof 9½″ x 10″. Entrance 2½″. Dowel perches ⅜″ x 4″ long.

WHAT ABOUT WATER?

Keep shallow birdbath (not more than 2″ deep) available, near a house outlet so it can be easily cleaned and FILLED DAILY WITH FRESH WATER. Place it in the open but close to shrubbery for quick retreat. Where cats make it necessary, place on pedestal, near shrubbery.

Make box 6″ x 6″. In top of box, place a plastic bowl for water. Get an extension cord and place a socket underneath bowl for a 25 watt light bulb. Attach to outlet. This will prevent water from freezing. Easy to make, expense is negligible, results are rewarding!

You will still have questions — find interesting answers in: "Songbirds in Your Garden" by John Terres, Thos. Crowell Co., N.Y., $3.95 and "The New Handbook of Attracting Birds" by Thomas P. McElroy, Jr., Alfred A. Knopf, N.Y., $4.00.

SUGGESTED ENVIRONMENTAL EDUCATION ACTIVITIES

ECOLOGICAL

1. Have students examine the geology of their school grounds, then extend explorations to nearby water areas. Study such phenomena as weathering, rock formations, water and wind erosion. Students should learn to identify environmental/ecological problems, to explore methods of attaching them, and to test under actual conditions the validity of their proposed solutions.

2. How can you make a patch of bare soil into one which is productive? Generally discuss the importance of plants in the world. Study soil and suggest reasons for its barrenness. Plan a series of efforts to make it capable of production -- food plants or ornamentals, from seeds or transplants. Take photos before and after to show how you make your selected "desert" bloom.

3. Conduct an Ecology Fair with photographic displays, exhibits, posters, water samples, bottled "clean air", sculpture made from trash or waste products, special "post office" for depositing letters to governmental and industrial officials regarding environmental problems, "population room" designed to capture physical and psychological atmosphere of overcrowding.

4. How does rain affect the life in the area where you live? Make investigations of plants and animals after a rain. Dress for rain and go outdoors during a rain -- listen to the birds' rain songs. Where do the birds go when it rains? What do they do to "waterproof" themselves? Why do earthworms come to the surface? What happens to some flowers when the sky gets dark?

5. Grow plants in class. Cut off the top of a carrot and submerge in water; put a sweet potato in a jar and partially cover it with water; plant bulbs in a container using rocks and water; place the stem of a geranium or a twig of pussywillow in a jar of water. Observe the growth of the new plants.

6. How does the environmental pattern affect the way people live? What are the major industries in the immediate area? How do these industries affect the water? What natural resources are used for recreation?

7. Is the population pattern affected by the environmental pattern? Why do people migrate to this area? Why do people emigrate from this area? How do the population patterns affect the environmental pattern?

a. How does this area fit into the overall pattern of the nation?

b. Note examples of interaction -- plants turning to sunlight, moss growing on rocks, etc.

c. Note examples of interdependence -- plants depend on bees to pollinate, bees depend on plants for nectar; we depend upon power companies for electricity, the companies depend on us for money to operate; some fish depend on plankton for their food; plankton depends on fish for carbon dioxide, its food; the moon depends on the earth to keep it in orbit, the earth depends on the moon for tidal action.

8. At a park site or forest area, you will find many examples of interdependence and interaction among living and non-living things.

a. How do trees interact with you? How are you and trees interdependent? Did you know that trees transform the carbon dioxide you exhale into oxygen? What are some other examples of interaction and interdependence?

b. List and discuss examples of temporary imbalances observed. (Interaction and interdependence keep things in balance normally; when these forces are altered, temporary imbalances result, for which nature compensates in ways that often appear chaotic to human beings.)

9. Have discussions on the following questions:

a. How has man interacted with water to change his environment?

b. How has man used the air to change his environment?

c. How does the moon affect the earth's environment?

d. How does the sun affect the earth's environment?

e. What physical forces are interacting with the immediate environment right now?

10. Set up an aquarium -- arrive at a balanced environment for animal and plant life. Observe breathing of fish.

11. Prepare a bird feeding station at home. Offer several types of foods. List the different kinds of birds observed and which kinds of foods they seemed to like best. Report results back to the class.

12. Have students report on the following topics:

    a. Eco systems and man: space research, water, climate, land use.

    b. Population control and society.

    c. The tyranny of progress.

    d. Ecology -- conservation and human behavior.

    e. The Human Race Has, Maybe, Thirty-five Years Left!

    f. The State of the Species -- Origin, Proliferation, Food, and the Mess We Are Making!

13. Discuss with the class the extreme danger of playing in small closets, cupboards, trunks, and especially in old refrigerators.

14. Ask the class to find out how the astronauts breathed in space. Get illustrations and bring report to class

15. Visit a farm and observe an irrigation system. List advantages and disadvantages of this system to the farmer.

16. Make a bird bath at school and at home and observe the birds that come for water.

17. Provide illustrations of geometric progressions vs. arithmetic progressions to illustrate Malthusian principle. Calculate some of the horrors that will take place if the population increase isn't slowed. (The world population is now doubling every 37 years).

18. Study (perhaps experiment with) effects of overcrowding noise, air pollution, etc., on laboratory animals.

19. Do research on the environmental effects of various products and p actices; e.g., plastic containers, strip mining, discharge of industrial waste into rivers.

20. At least 86 species of wild animals (mammals, birds, and reptiles) are now in danger of extinction. Make a study and arrive at some basic recommendations on how to alleviate this situation.

21. Establish an environmental corner in the library -- books, clippings from newspapers and magazines, pictures. Have an ecology bulletin baord.

22. Study population program aiming at zero growth.

23. Organize park and street clean-up festivals.

24. Prepare posters and signs on various environmental aspects.

25. Take photographs relating to environment and arrange a bulletin board display.

26. Journalism group might prepare an ad or do a series of articles on ecology for the newspaper.

Natural Resources

27. Developing a nature trail: Choose an appropriate location. Clear it of debris. Establish the trail, planting or transplanting vegetation along the trail as needed. Study features of trail. Make signs for describing plants, animals, ponds, land formations, rock and soil types, etc. Later possible additions: Weather station bird feeders, observation tower, displays (e.g., cross sections of logs), bridge over stream, etc.

28. Appreciating the beauty in our environment as an important dimension in man's life: plan a trip outdoors -- a "soft shoe" walk. At times signal that "soft shoe" conditions are in effect. At this time the group will be completely silent -- so that distinct natural sounds may be heard. Make a class book of beautiful things, illustrated by pictures or sentence pictures. Encourage the students to make collections at home -- wood, fallen branches, fallen leaves, seeds, nuts, feathers, etc. Make a rock collection for exhibition in the classroom, or local library.

29. Soil erosion -- its causes and prevention: Show how some changes in environment are caused by man's carelessness and thoughtfulness: removal of soil cover, floods, bad farming practices, and lack of plants. Prepare a paper showing means of stopping erosion.

30. Is there an ugly spot nearby which should be beautified? Explore your neighborhood, find areas which you consider beautiful. List the standards you consider desirable. Also find some areas which do not measure up to your selected standards. Photograph or draw both types of areas. Make plans for an effort to improve Keep a record of each step in the project.

31. How does the common wildlife in your area survive? Make a survey of the area, indoors and outdoors, to compile a checklist of wildlife. Observe their habits, and determine which are considered "pests" in your community; check on controls to eliminate these pests. If help and cooperation are needed -- after approval of proper authorities, make plans to help.

32. Consider changing attitudes toward wilderness; once it was something to be defeated or tamed, now it is becoming something remnant of which should be cherished.

33. Activities to be done at a specific site: Observe the many kinds of communication, verbal as well as nonverbal animal as well as human, from nonliving as well as from living objects. Explore factors that hinder good communication.

    a. How many ways can one perceive environmental communications (seeing, hearing, touching, smelling, tasting)?

    b. How many different feelings do the physical perceptions of the environment convey to the alert observer (pleasure, joy, thoughtfulness, fear, hope)?

    c. How many different sounds can be heard on the site? How are they alike? How are they different? How can they be identified? What emotions do they suggest?

    d. Do inanimate (vegetable and mineral) objects in the environment communicate with us? How?

    e. What danger signals can you read from the environment which tell you the land has been misused?

    f. How many varieties of objects can be identified on the site? How are they similar to each other? How are they different from each other?

    g. What scientific laws can be readily illustrated?

    h. How many different kinds of populations are here? How are they alike? How are they different?

    i. How many of the things that you observe here can also be seen in your home environment?

    j. How many things in this site are available to man?

k. Art focuses upon the environment. What on-site discoveries can you make of subjects that would lend themselves to painting, song, dance, or other artistic interpretations?

l. Every area has a geographical history. What is the geographical history of this area? Was and is this area habitable by people? What other kinds of populations have been here? Are they still here? Are there new populations? Changed populations?

m. Patterns are infinite in the order of things. There are functional patterns in the way people, animals, and plants live together. Structural patterns are found in starfish, pine cone, zebra, Milky Way, beehive, highway, family, city council, marching band. The variety of patterns producing homes affects the variety of patterns of life inhabiting these homes. A good or useful or pleasing pattern can be destroyed if one element in it changes. Note evidence of a variety of patterns found at a specific sight.

n. Patterns in the environment are also patterns of art -- circles, ovals, squares, triangles, stars, spirals, crescents. How many of these can be identified at the site.

o. How could patterns of leaves, flowers, and plants be arranged to indicate the seasons of the year.

p. What similar environmental patterns, both on the site and in your home or school surroundings, have been rendered in art.

q. From the land formation, evidence of habitation, cloud patterns, and use of the land, what does the site "communicate" about its past, present, and future?

r. Man's modern existence necessitates a complex pattern of communication. How did patterns of communication figure in the on-site trip?

s. How have environmental factors influences or even dictated certain patterns of communication?

t. What animal communication patterns are recognizable on the site?

u. From a plant and animal count at the site, can you clarify how different topographies in the same area affect plant and animal population groupings.

v. What kind of statistical expressions can show survival patterns of plants or animals?

w. Is the number of rocks essential to the total environmental pattern?

x. What are the patterns (spatial, organizational, functional) that help to classify objects on the site?

y. How can statistical evidence clarify the effects of over-population on air, water, and the earth?

z. What is the design of each object? What is the function of each object?

34. Field trip: Take the children on a short trip around the school grounds where they can see many plants. Observe differences due to nutrition, light, etc.

35. Have children collect as many examples of seeds as they can find. Label and display. Cut open a number of seeds and note the stored food surrounding the embryo.

36. List foods and other useful products we get from animals. Illustrate the list with pictures.

37. List foods and other useful products we get from plants. Illustrate the list with pictures.

38. Prepare reports on such topics as these.

a. Can the world be saved?

b. Nature under attack.

c. Game ranching: Wild animals can be used as a source of food. Study this proposition and evaluate it.

39. Study basic resources: Air, sunshine, soil, water; all plant and animal life depends on them.

40. Conduct a study of school environment relative to improving lighting and beautification.

Henry Gibson of TV
A leader in the movement for a better environment.

Elements

I used to like fresh
air
When it was there.
And Water. . .
I enjoyed it
Till we destroyed it.
Each day the land's
diminished.
I think I'm Finished.

—By Henry Gibson*

COMPANY COLLECTING OLD CANS

This area's first can recycling center opened for business yesterday at the Continental Can Co. on U. S. 52 South of Winston Salem.

The company which is next to Jos. Schlitz Brewing Co. Plant, has set up two containers for all types of tin, steel and aluminum cans.

One container is for steel and two-metal cans, and the other is for aluminum cans. There are signs marking the two containers, and there is a log book for people to sign when they bring cans to the plant.

No one will be paid directly for bringing cans to the plant. Continental Can will collect money for the cans and donate it to one or more local environment groups.

F. Paul Wohford, plant manager of Continental Can, said the company expects to collect about $10 for every ton of scrap metal, and that the money will be distributed according to the amount of metal collected and the various groups in the area which bid for the money.

It has been estimated that it takes 25,000 cans to make a ton of scrap metal.

Once the containers are full, the clean cans will be weighed, crushed and loaded onto railroad cars. Rusty and dirty cans will be discarded. The crushed cans will be shipped to a steel processing

plant in Texas.

At the Texas plant the cans will be converted into metal products. Up to 20 percent of a new steel product can consist of recycled steel.

Wohford said cans should be separated by type, labels should be removed from food cans, and all cans should be rinsed.

He gave these guidelines for telling one kind of can from another.

Aluminum cans are rounded on the bottom, have tear-open tops, are lightweight and are normally used for beer or snack foods.

Steel cans have seams and are heavier than aluminum ones. They are the standard can in use.

Two-metal cans have aluminum tops with easy-open devices and steel sides and bottoms. They are usually beverage cans.

The American Can Co. in Greensboro has been collecting cans for several weeks and shipping them to a Baltimore, Md., firm for processing. A company spokesman said yesterday they are being paid from $10 to $20 for a ton of cans. He said the company loses money in the process because of the freight cost but that the company is participating in the program as a public service.

In Greensboro, if an organized group collects an extremely large number of cans, the money goes directly to that group.

October 22, 1971, Winston-Salem Journal

RELAXING WITHOUT TAXING THE ENVIRONMENT

To merely exist, each of us must tax our resources or pollute our environment to a degree. But to do this, merely to have fun, is ecologically irresponsible indeed. Think about this when you plan your recreational and vacation activities.

POLLUTING FOR FUN

Ironically, our present eco-crisis is accompanied by the increased popularity of gasoline-fueled pleasure machines: Power boats, water skiing, snowmobiles, private airplanes, motorcycles and racing sports cars. All consume fuel and pollute our air with exhaust emissions, some add their own particular hazards to our environment.

Power boats of joy riders and water skiers not only consume gasoline and emit exhaust fumes; they directly poison the water through gasoline leakage and their noise can be harmful to fish. What's wrong with sail boats or row boats, canoes or kayacs? The exercise is beneficial, too.

Snowmobiles (a fad which has boomed from under a thousand in use a decade ago into the millions) are even more destructive. To their fuel consumption and air pollution, add the following facts; Their excessive noise not only harms fish when driven on ice, it harms small land animals as well. These vehicles pack down the snow, suffocating many small burrowing animals. They destroy fledgling crops and trees. If you're a winter sports fan, what's wrong with skiing, sleighing, sledding and ice skating?

TELEVISION VS. CREATIVE RECREATION

In the quarter century since World War II, we have changed from a nation of creators to a nation of spectators and consumers. Television is vastly to blame for the change. Not only does the tube lure us from more productive activity; it continuously blasts its message of "Buy, buy, buy--bigger cars and whiter washes and disposable every." Televisions pollutes, too, through consumption of electric power.

Consider using leisure time for more creative and productive activities especially for your children: Sewing, cooking, gardening, wood-working, painting. Start a family musical group if you're so inclined; or encourage your children to write and stage dramas, instead of just watching them. Many things you would ordinarily throw out can be used as costumes and props.

When you want to relax completely, consider reading, reviving the lost art of conversation, or enjoying good music on the phonograph or radio (far less power is used, too) For nonproductive diversion,

The Recycle Story

Teams of Girl Scouts in canoes and rowboats sweep a river clean. Other girls spend weekends repainting park benches. School classes and clubs outdo one another bringing bottles to collection centers.

These steps are important. They help to make living more enjoyable in our towns and cities. But important as they are, they only touch the tip of a huge problem that affects our entire country. That problem is the handling and reuse of the waste every industry and home discards over the years.

To get a small idea of what this includes, peek into a street wastebasket. The chances are you will fin' it is a mine of potential "natural" resources, filled with old newspapers, empty pop bottles, cans and, sometimes, even old clothes.

Then visit a nearby city dump. There you will see broken refrigerators, old tires, discarded machinery, outgrown toys and sleds.

But broken, torn and grubby as this waste is, it holds the answer to two of the crucial issues we face today -- how to protect our natural resources from running out, and how to improve our environment.

It costs millions of dollars every year to collect, burn and dump city and industrial solid waste. Apart from the money spent that could be used to build schools and hospitals, disposal creates other problems: Burning adds to air pollution, dumping takes up precious space that could be used for other purposes.

But if industry and government made it a practice to fully reuse those natural resources -- metals, fibers and other materials -- that now make their way into incinerators or dumps, vast amounts of natural resources still in the ground or standing as timber in forests would be spared and useful dumping grounds would be reclaimed.

For example, each time we reuse a ton of waste paper, we save seventeen trees. Now, we use eleven million tons of waste paper to make new products and spare 200 million trees from being cut down. Each time we use reclaimed copper, lead or zinc we save the resources of our mines for future generations. The recycling of these metals is almost endless.

Recycling is not new in this country. It goes back as far as the American Revolution. At that time there was such a severe shortage of writing paper that even George Washington was forced to write his dispatches on scraps. To keep paper flowing from the mills, makers advertised for patriotic women to save old clothing from which rag paper could be made.

Industry still makes wide use of recycled paper. The finest grade of stationery is made from scraps of cotton textiles. Roofing materials and egg cartons use reprocessed waste paper. And many newspapers print on old paper that has been deinked and reprocessed. But much more can be done.

During the Second World War our paper industry used waste-paper for 35 per cent of its new paper-making. Today that percentage has slipped to about 20 per cent. But if we could push that percentage up to 50 per cent we would leave standing each year a forest equal in square miles to all of New England, New Jersey, New York, Pennsylvania and Maryland.

How much do other resources contribute to new manufacturing? Aluminum scrap makes up as much as 30 per cent of new production, copper and brass scrap 45 per cent, lead scrap 52 per cent and zinc scrap 25 per cent.

The scrap is collected from factories, government facilities, farms, railroads and cities and shipped to dealer yards for identification, sorting, processing and bundling, and then moved out to refineries, smelters, mills and foundries for remelting or converting. From there on to factories and mills for use in the making of brand-new home appliances, ski clothing, paperboard and other products.

The need for the continuing recapture of these raw materials was stressed recently by President Nixon in a message to Congress:

> "As we look toward the long-range future -- to 1980, 2000 and beyond--recycling of materials will become increasingly necessary not only for waste disposal but also to conserve resources.
>
> . . . A great deal of our space research has been directed toward creating self-sustaining environments, in which people can live for long periods of time by reprocessing, recycling, and reusing the same materials. We need to apply this kind of thinking more consciously and more broadly to our patterns of use and disposal of materials here on earth."

The Federal Government already has taken steps to permit greater use of recycled materials in the supplies it buys.

You, your family and your friends can also help to encourage the use of recycling. Here are some of the things you can do:

Ask your teachers to include information about recycling in classes so you can learn more about this vital process. Ask them to encourage the use of recycled materials in the products your Board of Education buys.

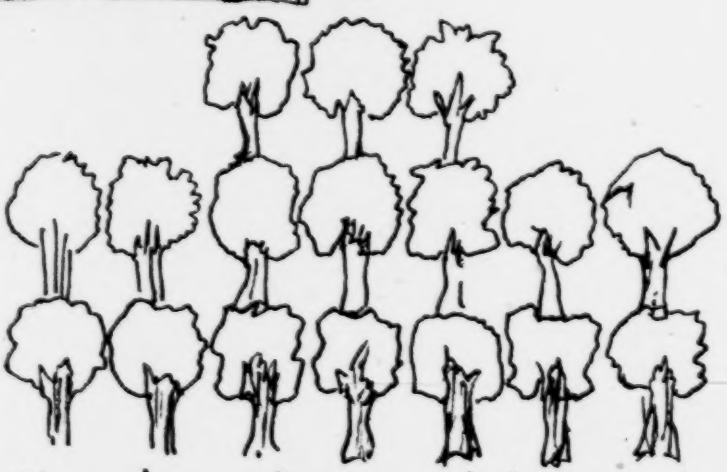
Write to your congressman, governor, mayor and city officials asking them to encourage the use of recycled materials in the products your state and city buy.

Write to manufacturers whose products you buy for use in your home asking them to make cans and bottles that can be recycled, and to put recycling labels on those products that use reprocessed materials.

Cooperate with local scrap drives, but make sure to ask those who run them to check whether the scrap can be sold to dealers.

For additional information about recycling, write to the National Association of Secondary Material Industries, 330 Madison Avenue, New York, N. Y. 10017.

Young Miss Magazine, December 1971
pp. 58-61



One ton of recycled paper saves 17 trees.

trees

. . . are cool, man!
They're nature's air conditioners.
They cool the temperature,
and filter impurities,
add oxygen to the air.
Let's keep them cool.

CONSERVATION IN YOUR SCHOOL

Teach and Practice Ecology in Schools

Develop environmental awareness by example and by classroom teaching.

There are two important ways in which schools can effectively cope with environmental problems.

First, of course, is the task of educating children in the ABC's of environmentally clean living. This can be simply integrated into all areas of learning, not merely in biology classes. Any concerned teacher, regardless of subject, can adapt material to make consistent appeals for ways of life that are ecologically sensible. In this area, talk to your school officials and teachers to discover what is being done. Support effective environmental teaching through your school board and PTA.

Second, schools should be models of good ecological practices. Many shortcomings of old buildings have to be accepted, but new schools should conform to the needs of a clean environment in terms of land use, construction, use of heat and light, planting, and waste disposal. (See following sections.)

Good environmental teaching in environmentally "clean" structures should be a basic aim of education in the fight against pollution.

Make School Buildings Ecologically Sound

Make environmental responsibility a part of building planning and maintenance.

When planning new buildings today make certain that every possible environmental consideration is made. For example, there are in existence today sewer-less toilets that use the same water over and over, producing no sewage. There are heat-recovery techniques, incredible insulations, solar energy traps, rain-water conservation practices, and trash and garbage pulping and composting machines that can enrich school lands with waste materials schools now throw away. The obvious answer is to select an environmentally aware architect. Help can be had from Malcolm B. Wells, Architect/Conservationist, P.O. Box 183, Cherry Hill, N. J. 08034.

Can changes be effected in existing buildings to make the school a part of the contemporary environmental picture? It's worth organizing a competent group to find out.

Prevent Runoff

Roof and parking lot runoff can be returned to the ground instead of the sewer.

A paved acre sheds almost thirty thousand gallons of water for each inch of rain. This water should be channeled to return to the ground instead of storm drains. Proper planning when lots are constructed makes this possible. Paving with porous material helps.

The use of sunken pebble gardens, reverse wells, deep mulch, dense planting, and ponds aid in the better use of water. Such planning will make school grounds useful as public parks during nonschool times.

Plant Vegetation to Conform to Land Use

Make plantings to coincide with the school's educational program.

Do not plant all of the grounds in grass or one type of cover. Many ground covers are attractive and are easier to maintain than grass. Pesticides should never be used. Let the school grounds be a field laboratory for biology and nature study for all students.

Reduce School Trash

Much can be reused or reduced to useful components on the school grounds.

Efficient waste management is important, but don't overlook the importance of reducing waste wherever possible. Outlaw one-way bottles and cans. Let a recycling center be a school project. Modify school rules to make reuse of paper (both sides) possible.

A fourth-grade class in Fort Collins, Colorado, solved paper waste in an old-fashioned and time-honored way: they made slates out of wall board, and cut paper consumption by 80 percent.

Consider Air Pollution

Depending on the system, investigate ways of eliminating air pollution.

Have the heating system inspected regularly. Do something about smoke. Consider converting to gas. Install smoke-reducing devices. Use heat-recovery devices on air exhausts.

Let Your Compost Be an Educational Project

Teach by doing and allow the practice to spread through the community.

Follow the methods on page 35 to make school wastes into compost. There can be one for the school maintenance and there might be additional ones maintained by classes as learning projects. The experimental possibilities by school groups are endless.

Outlaw Idling Buses

One of the worst forms of pollution to the air can be reduced by a simple rule.

Forbid the practice of allowing buses to idle in cold weather just to keep the bus warm. It is not necessary to have the motor running while a class makes a field excursion sometimes lasting more than an hour. Restarting the bus a few minutes before departure time can provide the warmth needed. Wear on the engine is at its height when the motor is idling.

Plant School Gardens and Maintain Model Yards

Let the school beautification be a part of classroom learning.

Plant school gardens and maintain sections of the school yard putting all good environmental practices to work. Organic gardening and pesticide-free yard-grooming can spread quickly to homes if properly taught in schools. Children have an abundance of things to toss to the winds. There is no better place to make meaningful progress toward a litter-free environment.

Watch for Unnecessary Waste in Planning School Events

Parades, science fairs, sports events and the like often waste materials needlessly.

Fancy floats for parades, many decorations for proms and special events, and school functions in general, often use large quantities of paper, plastic, etc. Consider the environment before making decisions. Use old paper for decorations. Newspapers make good papier-mache. Favors and table decorations can usually be devised from waste materials. Let a statement of environmental consciousness be a committee's first consideration in planning school events.

Devote Class Time to Environmental Study

Make environmental matters a part of many courses where the subject augments an existing course.

Use this book and other material as a text or reference. (See Bibliography on page 75, and How to Start an Environmental Information Center, page 72). Let Students pick appropriate projects for initiation in the school, at home, and in the community. Some can be class or group projects.

Keep Live Animals and Plants in the Classroom

Use living things to develop a respect for life.

Live plants and animals can be used effectively in the classroom for many subjects, or for aesthetic purposes. There is much about nature that can be taught automatically by the contact between a student and living things.

Make School Camping a Part of the Course

Take advantage of school camps, nature centers, and museums to augment environmental teaching.

Many areas have school camps where students can spend a day or a week living in an outdoor situation. Others have museums and nature centers that can be visited for firsthand encounters with nature and examples of good and bad environmental practices. Use them.

IT'S A POLLUTED WORLD

God gave man a wonderful world. In the beginning God created . . . the miracle of sun and stars, grass and flowers and every living creature. All creation and all creatures, including ourselves, began with God and are sacred. Man was to have dominion over all creation. Man was to live in harmony with God and to care for creatures and creation. But man chose to operate the world in his own way. (The Bible calls this sin.) Man fouled the air, poisoned the streams, cut the trees, and laid waste the bounty of the good earth. Man has infected and defiled his world. This is pollution. In the thirteenth century, St. Francis of Assissi, an Italian monk, tried to teach the Christians of his day to care for God's creation. Today prophets and scientists are speaking out for our time.

Some scientists are saying we need a Christian faith to give man a sense of responsibility for his world. As the caretaker of earth, man must use all available skills and methods of science. Man must control his ability to destroy every living thing, or soon the planet cannot support people at all.

The word ecology is often in the press. It means a branch of science concerned with the interrelationships of organisms and their environments. High school and college

students are turning to the experts in the sciences involved in ecology: biologist, chemists, physicists, and engineers. The technical know-how is available to stop pollution if the public is informed, and aroused. Youth across the nation are speaking out on this worldwide issue. Young Christians care. Why? Because anything that involves people is of Christian concern.

THE PRINCIPAL DOES IT AGAIN*

Dear Grace,

That principal of ours has done it again! You remember I told you when you retired a year ago last spring that I wished I didn't have three more years to go--with a new principal to get used to.

He's introduced more innovations than I thought Old Central would ever see: Student council, new mathematics, parent conferences, one thing after another, all year. And all of them seem to be successful.

When I began to see groups going outside at all times of the day and even in the snow, I thought "Well, here's one of his ideas that won't work. Those children will soon be behind in their studies!" I wondered what was going on, but you know how busy I've always been at noon getting work on the board--no time for idle chatter in the lounge. Yes, there had been some comments on the "outdoors" at faculty meetings, but I guess I didn't pay much attention--too preoccupied trying to figure out how to get my last year's troublemakers to listen.

I had seen vaguely some of the things various groups had in the hall: rock collections, and erosion display, even a slice of tree stump attached by strings to dated cards, but I didn't connect them with the outdoor activities.

This fall I was expecting a class that wasn't prepared for second grade. June's group had been outdoors so often, and I always get hers. What a surprise awaited me! These second graders have kept me humping! They are so curious and so eager to learn, what wide interests they have, and such good attitudes toward each other!

I noticed all these things about the group from the beginning and thought "June had a superior group for once." The IQ's weren't any higher than usual and the family backgrounds were the usual for Central so I began to think there must be something else. I decided to talk to June because I've always said I wouldn't keep on taking my salary, no matter how old I was, if I couldn't do what was expected of other teachers for the good of the children.

What she said was a revelation to me, but Doubting Thomas that I am, I didn't believe that teaching outdoors could make that much difference. She admitted she'd always liked to be outdoors and she hadn't minded studying Mr. M.'s books on outdoor education. He had helped her plan the first few outdoor experiences and had even gone with her group a time or two. She said she guessed the children were a little in awe of the PRINCIPAL

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*PHYLLIS J. WILSON, Primary Teacher
Hermes School, Aurora, Illinois
ILLINOIS JOURNAL OF EDUCATION, December 1964.

so there weren't any discipline problems those first days and after that they were so busy learning that there was very little mischief.

"But WHAT can they learn outside?" I asked.

June bubbled over. "We try to look and listen closely, and to look for relationships. Maybe that's one reason why you've found that your group of children has the ability to distinguish between sounds and between words the way they do, and why they are more thoughtful in predicting the outcomes in the stories they read." Those were characteristics of the group I had mentioned to her.

About that time I questioned, "Then you don't just do nature study?"

At that June was off again to tell about mathematics outdoors. She said there is big variety in the sets of leaves, leaflets, flowers, etc., for the children to find. Outdoors everyone in a group can discover and demonstrate mathematics concepts at the same time. Her group had even tramped out number lines in the snow. Finally, she said, "I could talk all night. Come and see some of the follow-up work."

"First graders have always gathered pretty leaves in the fall," she went on. "Look what the children have done with them this year. Here's a bulletin board Ellen's group arranged. It's giving them extra practice in seeing likenesses and differences. The only thing I did was to suggest the yarn to separate the rows of leaves. Ray's group is more advanced. They've been using the library books to match leaves and find the names of the trees. Look at their chart. It has been a wonderful motivation for writing."

Grace, I wish you could have seen that room. It was full to overflowing with good ideas. No old-style color charts, but leaves, flowers--even feathers--glued on with the names of the colors beside them. A chart of the sounds they'd heard! Group stories about their outdoor activities. Oh, there were just too many ideas for me to remember, but I could see that I'd been missing a rich, inexpensive resource right under my nose and that it would be cheating the children not to use it.

I thought about it that night and with many qualms--you know I'm no nature-girl--I asked Mr. M. the next morning for a conference. I can't help but admire him. He was so willing to help and the first thing I knew we were discussing curriculum areas that could be enriched outdoors. Before the week was over we were outside the building together with my group. We had those few minutes all planned, and he just stayed in the background except to make the comment that he'd never noticed how dry the ground stayed under the overhanging roof.

That first experience showed me so much about the children: shy Helen volunteered; Billy forgot to poke everybody because he was busy carrying our wet, little caterpillar; Tom showed his first interest in mathematics when he measured how far up on the building the soil splashed. Their sparetime stories were entirely different from the "I like my cat. My mother likes my cat. Do you like my cat?" that I'd come to expect in second grade.

Since then we've been using the outdoors often. I've even found the teacher doesn't have to know all the answers--inside or outside. A person can learn with the children and still be respected, and there are so many "unplanned" opportunities for learning!

Wasn't Mr. M. the wise one not to push any of us into OUTDOOR EDUCATION? He just let it infiltrate from the enthusiasm of those he could nudge most easily!

How I wish you were here to help Central pioneer in this new frontier of education! You'd soon be "sold" on it too. I really regret that next year will be my last in teaching, yet I rejoice that I'll have time to pursue in greater depth some of my new outdoor interests.

I'll keep you posted.

Hastily,

Lou

LORD, I THANK THEE...

For the healing beauty of flowers
Welcome balm for the battered spirit...
For the exciting wonder of new life
As manifested in the smallest creatures...
For the majesty of trees that protect our soil,
Husband our waters, provide us shelter...
For the mysterious process of plant growth
And endless bounty of fields that nourish my body.

LORD, GIVE ME KNOWLEDGE...

Help me to understand that life on earth is part of
An awe-inspiring pattern, with man the chief steward.
Teach me to appreciate the delicate relationship
Of all things on earth:
The majesty of an elk...
The springtime promise of a pussy willow...
The crystal purity of a dew drop.

Lord, teach me my proper place.
Guide me in doing my part
To solve the problems that beset us.
Let me be as dedicated to thes task
As a bee gathering pollen.

LORD, GIVE ME PERSPECTIVE...

Show me how to draw inspiration from the daily miracles
I can witness on any walk in the outdoors.
Help me remember that a song and a smile
Are more in tune with life than a wail or a frown.
Make me realize that just as in nature there is
Both tranquility and power -
So that capacity also resides in me.

LORD, MAKE ME HUMBLE...

Please give me humility to see how crude the most
Spectacular man-made thing is compared with...
A baby rabbit...The wondrous perfection of a snowflake.
Or the grandeur of a 4,000 year old bristlecone pine.
Give me the wisdom to know that if our environment
Fails wildlife, then I, too, am doomed.

LORD, OPEN MY EYES...

Help me to understand that
We are indeed all God's creatures.
This is my prayer
I hope a prayer for all Americans.

Amen.

A/V Media RESEARCH

BUREAU OF AUDIOVISUAL EDUCATION

THE UNIVERSITY OF NORTH CAROLINA

KENNETH M. MCINTYRE, *Director*

Chapel Hill

FREE WILDLIFE MOTION PICTURE FILMS

UNIVERSITY OF NORTH CAROLINA
BUREAU OF AUDIOVISUAL EDUCATION
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Chapel Hill, North Carolina 27514

Telephone 933-1108

WILDLIFE RESOURCES COMMISSION MOTION PICTURE LIST

This motion picture film list describes the films in the North Carolina Wildlife Resources Commission's collection. The titles are listed in alphabetical order with complete description and running time on the following pages. A subject index with page numbers is included in the front of the film list.

The North Carolina Wildlife Resources Commission has requested the Bureau of Audiovisual Education of the University of North Carolina, Chapel Hill, N. C. 27514, to handle the distribution of their motion picture film collection effective 1 September, 1971. The Wildlife Resources Commission has prescribed the conditions under which the films may be booked for your use free of charge.

All requests will be handled on a first come, first served basis and the N. C. Wildlife Resources Commission has requested that films be booked for one day's use, and that not more than two titles may be requested for any single use date.

Bookings should be made at least two weeks in advance -- preferably longer-- to allow ample time for the films to be scheduled and reach their destinations. Please give a second and third choice in case the title requested is already reserved for the specified date. Please do not request more than two films for any one showing date.

Since the motion picture films described on this list are shipped to you free of charge as a courtesy of the N. C. Wildlife Resources Commission, we want to stress the importance of returning the films on the shipping date indicated on our confirmation form. Please use the shipping label enclosed in the case to return the film to this address prepaid. Be certain to use the Library Materials rate and insure the film in order to guarantee its prompt return.

If you wish further information on the N. C. Wildlife Resources Commission films, please forward your requests to us at this address.

University of North Carolina
Bureau of Audiovisual Education
P. O. Box 2228
Chapel Hill, North Carolina 27514

SUBJECT SECTION

ANIMALS

AMERICAN BALD EAGLE, THE	C	16 min	1
BALD EAGLE, OUR NATIONAL BIRD	C	33 min	1
BIRDS OF PREY	C	27 min	1
BOB WHITE THROUGH THE YEAR	C	50 min	1
CLEAN WATERS	C	24 min	1
KNOW YOUR DUCKS	C	15 min	3
MAMMALS OF THE COUNTRYSIDE	B	11 min	4
RETURN OF THE WILD TURKEY	C	25 min	4
STORY OF THE MOURNING DOVE, THE	C	38 min	5
WATERS OF COWEETA	C	20 min	6
WE SHARE THIS LAND	C	16 min	6
WHOOPING CRANE, THE	C	14 min	6
WILD FOWL IN SLOW MOTION	C	10 min	6
WILDLIFE BABIES	C	25 min	7
WOOD DUCK WAYS	C	20 min	7

ECOLOGY

CONSERVATION AND BALANCE IN NATURE	C	18 min	2
ESTUARINE HERITAGE	C	25 min	2
LIFE IN A TROUT STREAM	C	10 min	3
SALT WATER RODEO	C	13 min	4
THE SUNFISH	B	11 min	5

HUNTER SAFETY

EXPLORING THE FARMLAND	C	13 min	2
FIELD TRIP TO A FISH HATCHERY	B	10 min	2
ISLANDS OF GREEN	C	24 min	3
LOST HUNTER	C	22 min	3
SHOOTING SAFETY	C	12 min	5
SURE AS SHOOTING	C	22 min	5
TRIGGER HAPPY HARRY	C	20 min	5
THE WINDOW	C	17 min	7

HUNTING

BAY AT THE MOON	C	30 min	1
GUNNING THE FLYWAYS	C	30 min	3
QUAIL HUNT	C	10 min	4
UNUSUAL HUNTING IN NORTH CAROLINA	C	14 min	6
THE WHITE-TAIL BUCK	C	29 min	6

POLLUTION AND HABITAT DESTRUCTION

CRY OF THE MARSH	C	17 min	2
GEORGE WASHINGTON'S RIVER	C	28 min	2

POLLUTION AND HABITAT DESTRUCTION cont.

THE GIFTS	C	28 min	2
LAND OF THE PRAIRIE DUCKS	C	26 min	3
MARSHLAND IS NOT WASTELAND	C	17 min	4
THE PERSISTENT SEED	C	15 min	4
SO LITTLE TIME	C	28 min	5
WE SHARE THIS LAND	C	16 min	6

WATER SAFETY

BOATS, MOTORS, AND PEOPLE	C	17 min	1
OUTBOARD OUTINGS	C	17 min	4
SUDDENLY UPON THE WATERS	C	27 min	5
WATER WISDOM	C	23 min	6

PLEASE NOTE: In order to provide you with the best possible service, please follow these minimum requirements:

(a-) Make your requests for films as far in advance as possible, but not less than two weeks;

(b-) Give at least three alternate choices;

(c-) Do not request more than two titles for a single show date;

(d-) And remember that the Wildlife Resources Commission is providing this film service free of charge for one day's use.

PLEASE RETURN ALL OF YOUR FILMS ON THE SHIPPING DATE REQUESTED, IN ORDER THAT THE NEXT USER MAY NOT BE DISAPPOINTED.

Please apply to this address for information regarding purchasing procedures for 16 mm motion picture films.

AMERICAN BALD EAGLE C 16 min
Rental n/c

From the mangrove islands of Florida and the vast wilderness of Alaska come vivid scenes of America's majestic national bird. An endangered species beset by hunters, pesticides, and destroyed habitats, Bald Eagle is now a center of vigorous conservation efforts to save it from extinction.
Prod-CORF Dist-CORF

THE BALD EAGLE, OUR NATIONAL BIRD C 33 min
Rental n/c

The life history of our majestic national bird comes to the screen in vivid color. Filmed in the wild, the picture is both educational and entertaining.
Prod-NAS/NPS Dist-USF&WS

BAY AT THE MOON C 30 min
Rental n/c

The excitement of hunting with hound dogs is for everyone to enjoy in this film. Unusual narration takes the form of a banjo-paced folk ballad.
Prod-MPO Dist-Remington Arms

BIRDS OF PREY C 27 min
Rental n/c

Eight years in the making, this film tells the story of some of nature's most efficient predators, the hawks, eagles and owls. Good photography and filled with interesting information. (Elementary school children)
Prod-MDof G&F

BOATS, MOTORS, AND PEOPLE C 17 min
Rental n/c

Designed for education as well as entertainment, this movie deals with the safe operation of outboard boats. It tells a fast moving convincing story.
Prod-ANRC

BOB WHITE THROUGH THE YEAR C 50 min
Rental n/c

The central theme of this film is quail's dependence upon man's use of the land; the role of food, cover, weather, predation (including hunting) and all other ecological factors are explored beginning with spring nesting and following the birds through summer, fall, winter, and back to spring.
Prod-MCC

CLEAN WATERS C 24 min
Rental n/c

This conservation film graphically contrasts the many benefits derived from clean water with the many losses resulting from pollution.

CONSERVATION AND BALANCE IN NATURE C 18 min
Rental n/c

Everything is balanced in nature...from the tiniest tadpole to the mightiest grizzly bear. This film explains that balance through observation of various animals and the special niche they maintain in natural surroundings. An excellent instructional film.(Elementary school children)

CRY OF THE MARSH C 17 min
Rental n/c

Marshland destruction and its devastating impact on wildlife is the message of this film. With poignant realism, it cries out against the tragic fate of our marshlands and the wildlife it supports. Excellent footage of waterfowl.
Prod-Bill Snyder Films

ESTUARINE HERITAGE C 25 min
Rental n/c

Because of the numerous living things that abound within them, estuaries and the salt marshes that interact with them are considered the richest of all natural environments. This film tells of the great value of the estuarine-salt marsh complex to both man and wildlife, and of the dire consequences of its destruction.(Grades 4 and up)
Prod-GSMF

EXPLORING THE FARMLAND C 13 min
Rental n/c

Three youngsters visit a farm for an exciting day of discovery. They find everything from swallows to baby skunks. A delightful nature film for young people.
Prod-Roy Wilcox

FIELD TRIP TO A FISH HATCHERY B 10 min
Rental n/c

A black and white sound film describing the operation of a large government fish hatchery and natural history of trout and presenting basic principles of conservation on an elementary school level.
Prod-CORF Dist-CORF

GEORGE WASHINGTON'S RIVER C 28 min
Rental n/c
This important film about pollution in the Potomac River should be seen by all citizens. It graphically portrays the evils of pollution while pointing out that there are sound methods for cleaning up our rivers.
Prod-USPHS

THE GIFTS C 28 min
Rental n/c

The rivers and lakes of America no longer run free and clear and this hard-hitting film shows just how extensive is the pollution of our waterways. The excellent photography of the film graphically documents this widespread befoulment of this nation's waters. Narrated by Lorne Greene.
Prod-U.S. Bureau of Sports Fisheries and Wildlife Dist-USDI

GUNNING THE FLYWAYS C 30 min
Rental n/c

Want to do duck or goose hunting? This action-packed film will take you to choice spots across the continent--including Lake Mattamuskeet in North Carolina.
Prod-Larry Madison Prod

ISLANDS OF GREEN C 24 min
Rental n/c

As America's rapidly dwindling wilderness areas become more remote, the value of nature education increases. This film illustrates the vital role nature centers play in the education of our youth.
Prod-USDA

KNOW YOUR DUCKS C 15 min
Rental n/c

This film is a short course in duck identification. Illustrations and photography are utilized to teach hunters to distinguish between hens of various species as well as drakes. The film suggests that only drakes be bagged during periods when waterfowl populations are low.
Prod-Office of Information

LAND OF THE PRAIRIE DUCKS C 26 min
Rental n/c

This film is an outstanding pictorial review of the loss and destruction of natural water retention areas in the prairie pothole country of the United States and Canada. Land of the Prairie Ducks is far more than a nature film. It is a factual and forthright presentation of the duck situation in North America. It tells what has happened to what was once the greatest duck-producing area on the continent and suggests what must be done to preserve that which remains.
Prod-MinnFd

LIFE IN A TROUT STREAM C 10 min
Rental n/c

This film is a study of the problems of survival faced by a trout in a rocky stream. It shows how highly developed instincts help protect the fish. In an underwater sequence, egg laying, fertilization and hatching are shown.

LOST HUNTER C 22 min
Rental n/c

A simply told story of a man who became lost. He tells why he got lost, the mistakes he made, the things he did right, and how he is found. The importance of proper preparation and equipment is explained by the lost hunter as he faces his problems. Basic precautions about the outdoors are presented.

MAMMALS OF THE COUNTRYSIDE B 11 min
Rental n/c

A black and white sound film describing, on an elementary level, the natural history and importance to the natural community of eight species of mammals found in North Carolina
Prod-CORF Dist-CORF

MARSHLAND IS NOT WASTELAND C 17 min
Rental n/c

The story of coastal marshlands and their value in our world today. Particularly significant in this day of wetland destruction.
Prod-Roy Wilcox

OUTBOARD OUTINGS C 17 min
Rental n/c

Narrated by TV's Gary Moore, the film was produced with the co-operation of the United States Coast Guard Auxiliary. This film highlights safety precautions that should be observed, the boater's rules of the road, fair and foul weather boating techniques, and similiar pointers designed to make your use of America's lakes, rivers, and coastal waters a safe and pleasant experience.
Prod-ALAC Dist-AS&CC

THE PERSISTENT SEED C 15 min
Rental n/c

A seraching look at the destructive influence of man on his environment. Produced by the Canadian Film Board, this film features superb photography.
Prod-CFB

QUAIL HUNT C 10 min
Rental n/c

Exciting hunting scenes and good dog work capture the delights of autumn hunting. Sound conservation overtones tell why's and wherefore's of quail food and cover.
Prod-MCC

RETURN OF THE WILD TURKEY C 25 min
Rental n/c

Probably the best film ever done on the majestic wild turkey, with magnificent photography of the birds habits and life cycle, the film focuses on the decline and subsequent restoration of the bird to much of its former range in Missouri.
Prod-MDC

SALT WATER RODEO C 13 min
Rental n/c

A sound color movie filmed off the coast of Florida. Shows tarpon

and sail fishing in what is truly a salt water rodeo.

SHOOTING SAFETY C 12 min
Rental n/c

A group of parents and sportsmen initiate a gun safety program for the youth of their community. A valuable educational tool for promoting hunting safety.
Prod-SA&AMfg.

SO LITTLE TIME C 28 min
Rental n/c

This film shows the waterfowl in North America, with some 30-plus species seen. Included are scenes of the endangered whooping crane and Attwater's prairie chicken; also, buffalo, antelope, and mounted extinct species such as the passenger pigeon and Carolina parakeet.

Prod-USDI

THE STORY OF THE MOURNING DOVE C 38 min
Rental n/c

Beautifully photographed, the film follows the life of the dove through the year. Hunting sequences demonstrate why the species is popular everywhere.

SUDDENLY UPON THE WATERS C 27 min
Rental n/c

This film illustrates the importance of courtesy and safety for all people who use the waters of America. It shows that when people have consideration for the safety and comfort of others, the waters are indeed a happy and joyful place of play in the sun.
Prod-DFI Dist-OBCA

THE SUNFISH B 11 min
Rental n/c

A black and white sound film presenting the natural history of a sunfish.
Prod-EBF Dist-EBF

SURE AS SHOOTING C 22 min
Rental n/c

A father-and-son weekend hunting trip provides some valuable tips in gun handling and hunter safety in this film.
Prod-Werner Schumann Dist-NRA

TRIGGER HAPPY HARRY C 20 min
Rental n/c

Although humorous, the film effectively points out the "common sense" rules of safe gun handling through the blunders of Trigger Happy Harry.
Prod-BF

UNUSUAL HUNTING IN NORTH CAROLINA — C 14 min
Rental n/c

Tarheel sportsmen seek gray foxes on the Outer Banks, water fowl at Lake Mattamuskeet, and wild boar on the Santeetlah Wildlife Management area.

WATERS OF COWEETA — C 20 min
Rental n/c

In the Coweeta Valley in Western North Carolina, the U. S. Forest Service studies the effects of various land uses on the streams of a small watershed.

WATER WISDOM — C 23 min
Rental n/c

This enjoyable and effective safety film should be seen by everyone who participates in boating, fishing, or water sports. Its message is vital.

WAY OF LIFE — C 27 min
Rental n/c

This outstanding film explains the important role predators play in maintaining the balance of Nature. The actors are wildlife throughout.
Prod-MCC

WE SHARE THIS LAND — C 16 min
Rental n/c

This excellent film by the U. S. Soil Conservation Service demonstrates how correct soil and water conservation management on the farm can greatly increase better habitat for our wildlife.

WHITE-TAILED BUCK — C 29 min
Rental n/c

A young boy learns some valuable lessons in his first hunt for one of America's most popular big game species...the white-tail deer.
Prod-RKO-Pathe

WHOOPING CRANE — C 14 min
Rental n/c

This film focuses on the life history of the vanishing Whooping Crane and the conservation measures being taken to save it from extinction.
Prod-USF&WS

WILD FOWL IN SLOW MOTION — C 10 min
Rental n/c

The beauty and grace of flight comes to the screen as many species of water fowl perform. Close-ups help sportsmen to know their ducks.
Prod-Hawley-Lord Dist-Hawley-Lord

WILDLIFE BABIES C 25 min
Rental n/c

A color sound film produced by the North Carolina Wildlife Resources Commission depicting the young of a number of wildlife species in their natural habitat. It features an exciting series of close-ups of wood ducks as they hatch and leave the nesting box.
Prod-NC WRC

WINDOW, THE C 17 min
Rental n/c

An elementary school teacher brings conservation to her classroom by bridging the gap between textbook learning and the wonders of the out-of-doors.
Prod-Herman J. Engel Dist-Audubon Jr. Clubs

WOOD DUCK WAYS C 20 min
Rental n/c

This film shows many interesting events in the life of the wood duck that are seldom seen by sportsmen and emphasizes the value of nesting boxes.
Prod-UofMinn.

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3. American Humane Education Society
180 Longwood Avenue
Boston, Massachusetts 02115
Availability: Can fill most request
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4. Richardson Wildlife Sanctuary, Inc.
64 West Road, Dune Acres
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Availability: Book 3 weeks in advance.
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BEYOND TIME

This filmstrip gives a philosophical poetic approach to ecology. It emphasizes the beauty and oneness of all life upon this earth. It is taken from the writings and block-prints of Gwen Frostic.

Richardson Wildlife Sanctuary, Incorporated

FACE OF THE LAND, THE

This filmstrip, in full color, deals with conservation education shows some of the wildlife in the country.
Running time 15 minutes.

American Humane Education Society, The

FARM ANIMALS

This filmstrip, in full color, deals with humane education and tells the story of farm animals. Suitable for Grades 1-3.
Running time about 15 minutes.

American Humane Education Society, The

FOREST, THE

This filmstrip tells the story of the formation of a forest step by step, from volcanic rock to mature trees, and beyond. It emphasizes the ecological interrelationships between the plants and animals that precede, and exist in a mature forest. Appropriate for grades 5-8. A script accompanies the filmstrip. 58 frames.

Lassen Volcanic National Park

FOREST OPPORTUNITIES, THE
STORY OF MULTIPLE USE

This set of slides, in full color, shows the multiple use of aspects of our forests: timber, water, wildlife, and recreation. The narration is provided by tape.

Appalachian Hardwood Manufacturers Incorporated

FOREST OPPORTUNITIES , THE STORY OF MULTIPLE USE

The set of slides, in full color, shows the multiple use aspects of our forest: timber, water, wildlife, and recreation. The narration is provided by tape.

Appalachian Hardwood Manufacturers Incorporated

LIFE OF A TREE, THE

This filmstrip describes in simple language the life of a tree from the seed through death and beyond. It includes the various parts of a tree and the functions they perform; how a tree grows; how seeds are formed; enemies and friends of trees. Available in two levels, grades 1-4 and grades 5-8, please specify which level is desired. A script accompanies the filmstrip (Available in Canada)

Lassen Volcanic National Park

MIRACLE OF THE SEA, THE

This filmstrip, in full color, deals with conservation education, and shows some interesting material on the sea. Running time about 15 minutes.

American Humane Education Society, The

MR. AND MRS. BEAVER AND THEIR FAMILY

This filmstrip, in full color, deals with humane education and tells the story of the beaver. Suitable for Grades 2-5 (Available in Canada)

American Humane Education Society, The

MR. AND MRS. MALLARD AND THEIR FAMILY

This filmstrip, in full color, deals with humane education and tells the story of Mr. and Mrs. Mallard. Suitable for Grades 2-5. Running time about 15 minutes.

American Humane Education Society, The

MR. AND MRS. ROBIN AND THEIR SPRINGTIME FAMILY

This filmstrip shows us the beginning of a new life in the spring. It describes the robin growth pattern.

American Humane Education Society, The

MRS. BEAR AND HER FAMILY

This filmstrip, in full color, deals with humane education and tells the story of Mrs. Bear and her family. Suitable for Grades 2-5. Running time about 15 minutes.

American Humane Education Society, The

MRS. COTTONTAIL AND HER SPRINGTIME F'.MILY

This filmstrip deals with humane treatment and acquaints pupils with the beginnings of life in the animal kingdom.

American Humane Education Society, The

MRS. SQUIRREL AND HER FAMILY

This filmstrip, in full color, deals with humane education and tells the story of Mrs. Squirrel and her family. It is suitable for Grades 2-5. Running time about 15 minutes.

American Humane Education Society, The

MOUNTAINS IN BLOOM

This filmstrip features a philosophical treatment of man's role in nature, using the flowering plant life, both herbaceous and woody, of Lassen Volcanic National Park, as a setting. The ecology aspects are emphasized rather than straight identification. This overall approach is designed more for thought-provoking discussion than for identification alone, though many plants are identified. Appropriate for grades 7-12. A script accompanies the filmstrip.

Lassen Volcanic National Park

NATURE ADVENTURES IN SOUTHERN INDIANA

This filmstrip, in full color, with narration on a record and a script to be read if a record player is not available, makes up a lecture on wild flowers, trees, common snakes, frogs, turtles and scenery of southern Indiana. The lecture was prepared by Mr. Mark Fraker, former State Park Naturalist. Suitable for all ages. Running time 30 minutes.

Richardson Wildlife Sanctuary, Incorporaged

PETS

This filmstrip, in full color, deals with humane education and shows how to care for pets in the Family. Suitable for Grades 1-3. (Available in Canada) Running time about 15 min.

REPTILES INHERIT THE EARTH

This filmstrip, in full color, deals with conservation education, and shows some of the common reptiles to be found in this country. Running time 15 minutes.

American Humane Education Society, The

SAND IN YOUR SHOES

This filmstrip, in full color, has narration on a record. A

script is also available if a record player is not available for playing the record. This lecture depicts a day in the Indiana Dunes from beach to back-dunes and return. It portrays the scenery, woods, beach, flowers, animals, birds, and insects of the dune area. Please specify whether the filmstrip or slide set is desired. It was written and narrated by Erma L. Pilz, naturalist, biologist, traveler and lecturer. Suitable for all ages. Running time about 30 minutes.

Richardson Wildlife Sanctuary, Incorporated

SOME MOTHS

This filmstrip and records, in full color, shows several species of moths and their various stages of development, food habit and a life history study. It also shows how they may be attracted, captured, retianed and studied by children. This is recommended for elementary children and should not be used beyond grade four.

Richardson Wildlife Sanctuary, Incorporated

SONNY SQUIRREL and THE PINE TREES

This filmstrip, in full color, deals with humane education and tells the story of squirrels. Suitable for Grades 1-3. Running time 15 minutes.

American Humane Education Society, The

THROUGH THE AGES

This filmstrip starts with spring and follows the changing seasons in Lassen Volcanic National Park. Plant and animal changes from season to season are shown, such as the butterfly-egg-caterpillar-chrysalis, flower to fruit, and bud to falling leaves of trees, nest building, egg laying, raising round, and migratory flight of birds. Available in two levels, grades 1-4 and grades 5-8; please specify which level is desired. A script accompanies the filmstrip.

Lassen Volcanic National Park

WILD FLOWERS OF TEXAS

This filmstrip shows some of the colorful native wild flowers of Texas in their natural habitats. There is an accompanying narration sheet describing each scene briefly which may be read as the filmstrip is projected. (This material is also available as a set of slides.)

Texas Highway Department.

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SEVENTH GRADE

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8.	Swamp Water Pollution The Air We Breathe	The Garden Club of America 598 Madison Ave. New York, NY 10022
9.	Environmental Studies	Instructor Handbook Series The Instructor Publications Dansville, NY 14437 or any company which sells instructor materials Worgan Brothers School Cat.
10.	North Carolina's Work in Environmental Studies	Governor of North Carolina
11.	Audubon Nature Bulletin	National Audubon Society 1130 Fifth Avenue New York, NY 10028
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